CONTRIBUTION TO KNOWLEDGE OF FISHES FROM BERING AND CHUKCHI SEAS

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A CONTRIBUTION TO THE KNOWLEDGE OF THE FISHES FROM THE BERING AND CHUKCHI SEAS

By

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TRANSLATOR'S PREFACE

Since World War II there has been a renewed interest in the resources of Northern regions. Surveys and inventories of our natural resources have been inaugurated under the auspices of several agencies and governmental departments. However, in the case of Alaska, research on the fish fauna by our government has almost all been concerned with commercial fishes as salmon, halibut and cod. The U. S. Bureau of Fisheries Steamer ALBATROSS conducted the last general ichthyological survey in the Bering Sea shortly after the turn of the century.

As a consequence, the results of a recent exploratory fisheries survey in Bering and Chukchi Sea waters by the Soviet government are of general interest. The following translated paper[1/] is based on expeditions carried out in 1932 and 1933. This material was first published in a Russian journal in 1937 by Anatoly P. Andriashev. Although other portions of the results of these expeditions have been translated into Western languages, to our knowledge this is the first translation of the ichthyological report.

Insofar as possible the translation is a direct one from the Russian language. However, obvious lapses in spelling and references were corrected.

The costs of this translation were borne in part through funds provided by a contract between the Office of Naval Research and Stanford University -- Contract N6onr25136.

1/ Andriashev, Anatoly P.
1937. A contribution to the knowledge of the fishes from the Bering and Chukchi Seas. Explorat. des mers de l'URSS. fasc. 25, Inst. Hydro., Leningrad, pp. 292-355, figs. 1-27. Russian English summary pp. 351-355.

A CONTRIBUTION TO THE KNOWLEDGE OF THE FISHES FROM THE BERING AND CHUKCHI SEAS

1. Introduction

The basis for the present work is the numerous collections of the Government Hydrographical Institute (GGI) and the Pacific Scientific Institute of Ichthyology (TIRH) made by the trawlers DALNEVOSTOTCHNIK ("Far East") (1932) and the KRASNOARMEIETZ ("Red Army") (1933).[1] Those expeditions were fortunate enough to cover a network of stations in the East and North Bering Sea and all Chukchi Sea. The DALNEVOSTOTCHNIK made about 100 hauls in 61 stations that were in the Southern Chuckchi Sea, Bering Strait, off St. Lawrence Id., near the mouth of the Yukon, Anadyr Gulf, along the coasts of Koriak Land (N. W. Kamchatka), Bering Island and the opposite coast of Kamchatka and Avacha Bay,[2] in depths chiefly from 20 to 235 meters. The deeper hauls (to 3860 meters) were fewer, made primarily with a dredge and Sigsby trawl. In 1932 about 1500 examples of fish were collected, chiefly by beam and otter trawls, some by Sigsby trawls and dredges and a few by special pelagic and planktonic nets (a total of 57 hauls had fish). While stationed at the coast observations were also made. In 1933 the ichthyologist K. I. Panin on the KRASNOARMEIETZ collected 1700 examples from 45 stations concentrated in Anadyr Gulf, Bering Sea, near St. Lawrence Id., and in the Chukchi Sea to the latitude of Wrangle Island. In addition to these basic materials, some other collections were used (from the Commander Ids. made by Kardakov and Rostov brothers, a few collections in Leningrad of the TIRH expeditions. There were two specimens of sardine-ivasi K. I. Panin collected in Kamchatka, etc.).

In studying the material, comparisons were made with the collections from the far East and North Sea in the Zoological Institute of the Academy of Sciences of the SSSR.

The collection contained 108 species of which 12 were new species and subspecies (ca. 11%) and only one new genus; part of the following list was published in other works (see footnotes).

1/ The 1932 collections were made by the author, in 1933 by K. I. Panin.

2/ See maps of 1932 and 1933 stations in G. E. Ratmanov's work on the "Hydrography of Bering and Chukchi Seas" in this symposium.

1. Icelus spiniger intermedius Lindberg & Andriashev.[1]
2. Stelgistrum concinnum Andriashev.[2]
3. Sarritor frenatus occidentalis Lindberg & Andriashev.[3]
4. Lycodes palearis arcticus Taranetz & Andriashev, subsp. nov.
5. Lycodes brevipes diapteroides Taranetz & Andriashev, subsp. nov.
6. Lycodes soldatovi Taranetz & Andriashev.[4]
7. Lycodes raridena Taranetz & Andriashev, sp. nov.
8. Lycodes diapterus beringi Andriashev.[5]
9. Gymnelis bilabrus Andriashev, sp. nov.
10. Gymnelis hemifasciatus Andriashev, sp. nov.
11. Commandorella popovi Taranetz & Andriashev.[6]
12. Lycodapus derjugini Andriashev.[7]

A portion of the family Zoarcidae (Genus Lycodes) was studied by Taranetz and myself. We postpone further treatment on the genus till later and here publish only the material on the Bering and Chukchi Seas. Unfortunately, the species of Liparidae are not included in the report as majority and most of the interesting forms taken are absent from the present available collections. (Careproctus, Elassodiscus, Paraliparis, in part Liparis, etc.).[8]

Only the basic ecological data are presented--depth, temperature and bottom. The other factors, salinity, acidity, pH, phosphate, etc., vary so little in the region investigated that their influence upon the distribution of fish has so far not been investigated.

The methods of measurement are included in the text. We must note, however, headlength is measured to the end of the opercular, and in counting rays of Zoarcidae, one half of the caudal rays are added to the counts of the dorsal and anal fins. The station numbers are double; the first is the hydrographic station number and the second, in parenthesis, is the benthonic.

1/ A review of the geographical forms of Icelus spiniger Gilb. Trudy Zool. Inst. Akad. Nauk, SSSR, 1935 (in press).

2/ Zool. Anz. Bd. 111, Heft 11/12, p. 292, fig. 1, 1935.

3/ "A review of the genus Sarritor Cramer (Pisces, Agonidae) of the North Pacific." Memorial volume N. M. Knipovitch (II), in press.

4/ Zool. Anz., 1935, Bd. 112, Heft 9/10, p. 246, fig. 3.

5/ Doklady Akad Nauk SSSR, tome 4, no. 1-2, p. 107, 1935.

6/ Ibid, tome 1, no. 4, p. 267, 1935.

7/ Ibid, tome 3, no. 9, p. 422, 1935.

8/ The 1932 collection of commercial forms (treska, mintay, navaga, nekotorye kambale) from southern regions (Avacha Bay) are absent from the laboratory, and were studied by the Pacific Institute of Ichthyology.

The data on the commercial fishes has not been included; the material is slight and has been considered in my distributional report.[1]

The illustrations were prepared by the artist N. N. Kondakov.

The study was carried out in the Hydrological and Ichthyological laboratory of the State University in Leningrad under the directorship of K. M. Derjugin, to whom we are grateful for his extensive studies on far eastern seas. Also I am grateful to L. S. Berg, P. Y. Shmidt and G. U. Lindberg who always helped my work.

I especially wish to thank my collaborators, A. Y. Taranetz, V. F. Shmidt, P. A. Moiseev, and K. I. Panin. I cannot say enough for the staff and crew of the trawler DALNEVOSTOTCHNIK and the expedition's leader, G. E. Ratmanov.

February 1, 1935. Leningrad.

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[1] "Geographical distribution of commercial fish of the Bering Sea and questions connected with it." Explorat. des mers de l'URSS, fasc. 22, Instit. Hydro., Leningrad, pp. 135-145. 1935.

2. Special Part

Family Rajidae

1. Raja sp.

Raja violacea Suvorov, Bull. Ac. Sci. URSS, 1935, p. 431, fig. 1. (West Kamchatka, 47-100 m.).

In Bering Sea (and also taken in Okhotsk and Japan Seas) is often found a skate, which differs from previously described forms in the absence or slight development of large bony tubercules on the tail and midline of the body. The dorsal surface is usually covered with small spicules which also cover the dorsal part of the tail not leaving any bare space about the tubercles, contrary to R. smirnovi Soldatov & Lindberg found in far eastern seas. In our collection is one new form from the Japanese Sea (at the mouth of the Povrotny at 195 meters) in which the disk and dorsal portion of the tail is covered with small spicules but no tubercles. On the tail are ca. 38 small fine spicules, which differ but little from the others. In the zoological institute of the Academy of Sciences SSSR are 10 examples of this form from the Okhotsk Sea and Avacha Bay which show much individual variation. The spicules on the tail are sometimes large and numerous; sometimes slightly developed, or in some absent. Also, the density of the body spicules vary. Similar examples from the Okhotsk Sea are described by E. K. Suvorov as R. violacea and compared with R. kenojei, R. binoculata and R. smirnovi. However, it appears much closer to R. interrupta Gill & Townsend (Bering Sea) with which its name may well be changed with the study of more material.

In the Bering Sea (reaching to 145 cm length) this species occurs to Cape Navarin and the southern part of Anadyr Gulf, which appears to be the northern limit of the genus Raja; however, local inhabitants say skates are taken in Providence Bay and off the Chukchi Peninsula.[1/]

Family Clupeidae

2. Sardinops sagax melanosticta (Temminck & Schlegel)

Sardine ivasi is very important commercially in the Far East. Until recently it was known only from the Coasts of China, Korea and southern Japan, from where it makes annual migrations to the north along the coast

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1/ On the American coast T. Bean (Proc. U.S. Nat. Mus., vol. 4, pp. 261) 1882 reported skate (on the basis of remains as R. parmifera) from St. Michaels (NE of the mouth of the Yukon River).

of Primoria and Japan, omitting the northern bays of Nivel (which is the northern part of Tartar Strait) and the southern Kuril Islands. Of special interest is the find of ivasi in East Kamchatchan waters by V. B. Bool and K. I. Panin[1/] in September of 1933 in Kronotak and Avacha Bays. In 1934 ivasi was again noticed on the East coast of Kamchatka in August, September and October.[2/] Single examples were sometimes found in early November and the catch exceeded a hundredweight.

The explanation for the presence of this species in Kamchatka brought about some discussion. V. B. Bool and K. I. Panin (1933, 1.c.) postulated the existance of a northern race which heretofore was not known commercially. G. U. Lindberg[3/] considered the waters of Kamchatka and the Commander Ids. the normal northern limit of ivasi. L. S. Berg[4/] considered the appearance of ivasi in Kamchatka as the natural outcome of fish and other organisms migrating northward, as a result of the "warming of the arctic and subarctic waters (firstnoticedapproximately in 1920 and earlier)."

However, an accepted view put forth by K. I. Panin[5/] states that ivasi extends its feeding migrations to the north in warmer years and reaches as far as the east coast of Kamchatka. The periodic occurence of ivasi in the north is correlated with the warm Kuro-Shio current and this fact is supported by hydrographic data. In recent years (1933 and especially 1934) the appearance of ivasi was characterized by increased water temperatures. However, in 1935, data by M. Y. Beckman indicated the water temperature dropped, which is also supported by the fact no ivasi were found in spite of a special search.

The two specimens presented by K. I. Panin (from Petropavlovak Bay, Oct. 25, 1934) have the following measurements: D(total) 18-19, A 18-19,

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1/ V. B. Bool & K. I. Panin. Ivasi in Kamchatkan waters. Gaz. Kamchatka Pravda of Sept. 7, 1933.

2/ K. I. Panin. Ivasi in eastern coastal Kamchatkan waters. KONIRS, 1935(M.S.)

3/ G. U. Lindberg "Priroda" No. 5, pp. 47-48. 1935.

4/ L. S. Berg. Problems of physical geography. II, pp. 77-78. 1935.

5/ K. Panin. Uber das Vorkommen der Pazifischen Iwashi-Sardin (Sardinops melanosticta (Schl.)) in den Gewassern von Ostkamtschatka. Zool. Anz., Bd. 115, Heft 5/6, p. 149. .

Sp. br. 120; keel scales before V 18-19, V to A 15-16. The total length 154-147 mm. In percentage of body length (fide Smith): head length 23.6-24.5, body depth 18.2-18.1, predorsal 39.7-40.0, preventral 71.0-71.2, caudal peduncle depth 6.3-6.0. In percentage of head length; snout 28.8-30.7, eye diameter 24.9-27.7, interorbital 18.0-18.3, upper jaw 43.5-43.3, lower jaw 55.5-55.4, pectoral length 60.0-57.5, ventral length 34.2-33.3. The two last rays of the anal fin are noticeably longer than the rest. A row of 6-7 black spots is present on each side of the body which are smaller than the diameter of the pupil.

K. I. Panin biometrically examined 223 examples of ivasi from eastern Kamchatka and found they possess a smaller number of gill rakers (ave. 123.55; range 108-139). However, the ivasi of the Primoria coast according to S. M. Kaganovsky[1] average 144.61 gill rakers ranging from 126 to 174. This difference may be explained by the smaller size of the Kamchatka ivasi. The 2 and 3 year old groups measure 14 to 20 cm and thus far do provide evidence to establish themselves as a separate race, or indicate their relationship to the California sardine (Sardinops sagax caerulea) which differs in a smaller number of gill rakers (according to W. F. Thompson an average of 131.1 ranging from 90-160).[2]

3. Clupea harengus pallasi Valenciennes

Seld were first found in early July in the southern part of the area investigated (Avacha Bay), taken in an otter trawl in 96 meters. All four examples were ripe males with full stomachs. In addition, in the stomach of an "arrow paltus" (Atheresthes evermanni), taken in Avacha Bay at 150 meters, there was a herring 30 cm long.

Herring are abundant in the Bering Sea, occuring on the Asiatic coast as far North as Anadyr Gulf. On the American coast, they occur in the warm current as far as Bering Straits (Port Clarence). Scofield (Fishes of Arctic Alaska, 1899, p. 494) notes that local inhabitants report shoals of herring near the mouth of the Mackenzie. The Marine Commerce animal group provided information concerning the winter occurence of a fish similar to herring, about 30 cm. long, in Providence Bay. However, these probably

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1/ S. M. Kaganovsky. Fishery Industries of the Far East., vol. 7, 1935, p.39.

2/ Quoted from K. I. Panin (1935, l.c.).

are not herring but an eastern Siberian fish (Coregonus sardinella) which is quite common in coastal regions of northern seas and known locally as "seld", "zeld", etc.

The commercially important herring in Bering Sea extends along the eastern coast of Kamchatka to Korfo-Olytorsky Cape. The commercial importance has increased in recent years and K. I. Panin reports the eastern Kamchatkan herring catch to be 22,000 hundredweight.

Family Salmonidae

4. Oncorhynchus keta (Walbaum)

Distributed from Avacha Bay to Providence Bay in Chukchi peninsula. Keta appeared in late July and early August; most of the catches being made in Anadyr estuary.

5. Oncorhynchus gorbuscha (Walbaum)

The northernmost distribution is recorded from the settlement at Cape Dezhnev and at Bering Strait. They occur in late July and early August in Providence Bay. In a river flowing into Imatra Bay (North Deep Bay -N. Gluboka) on September 11, we noticed gorbuscha that were spawning in shallow water about 1/2 kilometer from the mouth.

6. Oncorhynchus nerka (Walbaum)

We noticed nerka together with gorbuscha in Imatra Bay which were almost ripe. However, they traveled only in slow currents in deep water over sandy bottoms.

7. Oncorhynchus kisutch (Walbaum)

This species occurs in the fall in Avacha Bay (end of September). It occurs singly in Anadyr estuary after the fall migration of Keta.

8. Salvelinus malma (Walbaum)

The northern limit of malma is Bering Strait (settlement at Cape Dezhnev). The local Chukchee insist that forms living in the shallow lagoons divided from the sea by a narrow sand bar differ from the sea forms.

Family Osmeridae

9. Mallotus villosus (Muller)

The species was found quite often during the investigation from the KRASNOARMEIETZ (1933, st. 11, 18, 22, 77, 89) at depths from 65-74 meters and temperatures of 1.3° to -1.7° on sandy and clay bottoms. In Siberian waters it is absent (Kara sea, Laptev sea, and E. Siberian sea). However, they occur off the arctic coast of America and on the North Atlantic coast.

10. Osmerus eperlanus dentex Steindachner

Anadyr estuary, at the coast.

11. Thaleichthys pacificus (Richardson)

Salmo (Mallotus?) pacificus Richardson, Faun. Bor.-Amer. 1836, III, p. 126.
Thaleichthys stevensi Girard, U. S. Pac. R.R. Exp. Fish., X, 1858, p. 325, pl. 75, figs 1-4.
Osmerus albatrossis Jordan & Gilbert, Fish. Bering Sea, 1899, p. 439; Taranetz Ivest. Far Eastern Branch Ak. Nauk SSSR, No. 1-2-3, pp. 67.

Reported from Kodiak Id. to Northern California. During the TIRH expedition of the KRASNOARMEIETZ (1932) examples were found in the eastern part of the Bering Sea (A. Y. Taranetz, 1933, p. 67). Our examples, obtained at Pribilof Ids. measure:
D III, 9 A III, 18[1/] Sp. Br. 5 plus III 16 [2/]
Teeth weak, small teeth on jaws and pterygoid. Two thin weak hooked teeth on vomer. Glossohyal with still slightly larger teeth. Mouth large, upper jaw reaching almost to a vertical at end of eye. The eye is small, 5-1/2 in head. Opercular with clear concentric rings. The ventral fins are attached in front of vertical from nape so that preventral distance is less than predorsal. The peritoneum is dark. Total length 223 mm. Measurements in percentage of standard length; Head 20.0; predorsal 49.2; preventral 44.9; pectoral length 13.3; greatest depth 16.9; caudal peduncle depth 6.9. In percentage of head length: eye 18.0; snout 26.9; upper jaw 43.6; lower jaw 56.4.

1/ A. Y. Taranetz (l.c.) reports the following measurements: D III, 8-9, A III 17-18, sp. br. 5 plus 15-16, vert. 67 (68 with urostyle), pyloric caeca 9.

2/ Jordan & Gilbert, (1899 p. 439) obviously erroneously report 12 gill rakers.

Family Myctophidae

12. Lampanyctus beringensis Schmidt (Fig. 2)

Lampanyctus beringensis Schmidt, Copeia, 1933, no. 3, p. 131 (Bering Id., intermediate depth 93 fathoms)

During the deep water stations of the DALNEVOSTOTCHNIK (1932) off Cape Olytorsky seven examples of this interesting bathypelagic form were taken at depths to 3000 m. Our material came from a Sigsby trawl and non-closing plankton net. They are considerably damaged and only four could be used in preparing the description. However, we must note the deformation is due to sharp changes in pressure which is explained by the abnormal position of eyes and internal organs and also due to the mechanical action of hauling through 2-3 km of water when raising the nets.

Our examples are closest to Lampanyctus nannochir (Gilbert), and only a few slight differences in photophore position make us temporarily identify it with L. beringensis described a short time ago by P. Y. Shmidt.

D 14-15, A 15-16, P 8, V 8, C 18-20, upper procurrent caudal rays 6-7, lower 7-8. Ll 37-38. R. br. 6.

The body is relatively long and compressed; its greatest depth 16.7-19.3 percent of the standard length. The caudal peduncle is long and does not taper 25.9-28.4%. Caudal peduncle depth 7.2-9.1%. The head is large and abruptly narrows from the nape to the snout, length 25.9-27.3%. Eye large, its diameter 5.9-7.4%, about 4 in head. Interorbital broad and flat, 12-18%, its length is divided dorsally by a thin parallel ridge which is interrupted in the middle by a light bump (possibly a light organ?). A similar formation is found on the end of the snout between the premaxillary. There are two short ridges behind the eye. Over the eye is an orbital shelf of cartilage. It is hard in adults but spongy in the young (54-60 mm SL). The large mouth is conical. The border of the upper jaw is formed by the premaxillaries which extend almost to the front of the preopercle, 17.6-20.5% SL or about 3/4 the head. The lower jaw does not protrude, its proximal edge extending to the subopercular and forming the lower angle of the head. Its length is 18.8-21.7% SL or about 4/5 the head. Small, very fine hair like teeth occur on the premaxillary, dentary, vomer and palatines, the pseudobranch is developed. Gill rakers fine and numerous.

Body covered with fine deciduous scales which are in six to seven longitudinal rows. Head naked. Scales of Ll not enlarged, with a double channel. Predorsal 43.2-45.0%, preanal 53.4-55.6%, preventral 36.4-39.2%.

The distribution of photophores corresponds basically to the type (No. 27745 Zool. Inst. Akad. Nauk SSSR). The abbreviated photophore terminology is that of Parr[1/] and is indicated by figure 1. The photophores are small, circular without horizontal division. One PLO about middle between the pectoral fin and lateral line (not closer to pectoral as stated in the description of the type). Two PVO are placed over each other over the base of the pectoral. Pectoral photophores (PO) number five. The anteriormost is separated from the series by twice the normal interval. PO_4 is elevated to the level of the pectoral fin. There are four ventral photophores (VO). Between the interval separating VO_1, and VO_2, between this series and the lateral line is the super ventral VLO. Three SAO in an oblique row, the last not reaching the Ll but separated from it by a space its own diameter, and from SAO_2 by the space equal to the distance between the first and second VO. Anal photophores (AO) in two series, anterior (Ant. AO) 6-7, posterior (Post AO) -8; both series in line. Over the space between the two series is a single PLO, placed under the Ll at a distance equal to its diameter. Precaudal photophores (Prc) 4. The two first a continuation of the AO, the last two forming an arc which ends under the end of the lateral line. In all, a total of 35 photophores.

Caudal peduncle with dorsal and anal luminous scales (Lsc). The better preserved example (98 mm TL) has 6-7 super Lsc and 7-9 Inf Lsc. Two small photophores on preopercular. Preorbital organ (Pr. O) is inervated by a few slightly reduced rami from the N. olfactoruis, but obviously serves as a light organ.

Dorsal high, originating on a vertical behind the ventral. Dorsal base almost as long as anal base 14.8-19.3%. The longest ray is the 6th. First two rays stiff in young but in adult only the first is short and spine-like. The posterior end of the dorsal terminates on a line with the 6-7 anal ray. Base of the anal fin 16.7-19.8%, first ray low and stiff. Longest ray is the 3rd and 4th. Ventral fin well developed, not quite reaching anus, its length 9.1-11.1%. Pectoral reduced, one half diameter of eye. The caudal rays long but not divided and become shorter anteriorly. (C. Sp.). Upper Cap 6-7, lower 7-8.

Remaining scales dark brown. Dorsal portion of opercular, gill membranes, gills and lining of mouth and peritoneum are all black. Fins are dark. Standard length 44-88 mm.

1/ Parr, Notes on the species of myctophine fishes ... Proc. U. S. Nat. Mus. vol. 76, 1929, art. 10, p. 2, fig. 1.

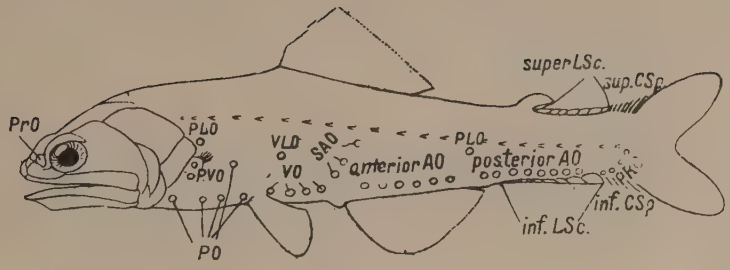

Fig. 1. Nomenclature of Luminous Organs in Lampanyctus (after Parr)

Fig. 2. Lampanyctus beringensis Schmidt. Near Cape Olytorsky

The bathypelagic existence is corroborated by the feeding of this species on deep water pelagic forms: Hymenodora frontalis[1] (fide M. Rathbun[2] usually inhabits 322 to 1771 feet in depths), Calanus cristatus (usually to 500 m, though recent data by M. A. Virketis indicate it rises higher), Eucalanus attenuatus, Conchaecia sp., Euchaeta sp., etc.[3]

Lampanyctus beringensis differs from the majority of the species of this series by a short reduced pectoral fin, which places it in a subgenus Nannobrachium Gilbert to which Jordan and Evermann (1896, p. 261) assigned L. mexicanum (Gilbert), L. macdonaldi (Goode and Bean), L. nannochir (Gilbert) (? L. leucopsarum (Eig. & Eig.)) and L. regalis (Gilbert). Of these, L. beringensis Schmidt is closest to L. nannochir and differs from it only in the presence of four PRC and a few pushed back VLO. The SAO and POL are placed closer to the lateral line and the adipose fin is posterior to a vertical extending from the end of the anal fin, (it begins over the last rays of the anal fin in L. nannochir) and is almost between the procurrent rays and the end of the dorsal fin (much closer to the Dorsal in L. nannochir).

This species obviously appears more common in depths at 500 m or deeper in the Bering Sea.

Family Scorpaenidae[4]

13. Sebastolobus alascanus Bean

Two examples from Bering Id. at depths from 200-235 m. (DALNEVOSTOTCHNIK, 1932, St. 70, (59)). Female 400 mm and juvenile 177 mm.

D XVI, 9-10-1/2, A III 5, P 21-22. Ll 33. Gill rakers $\frac{6\text{-}7 + 13\text{-}14 \text{ outer row}}{2 + 11\text{-}12 \text{ inner row}}$

14. Sebastodes polyspinis Taranetz and Moiseev

Sebastodes polyspinis Taranetz and Moiseev, in Taranetz, Ivest. Far Eastern Branch, Akad. Nauk, 1933, no. 1-3, p. 69.

1/ Described by V. V. Makarova.

2/ Harriman Alaskan Expedition, vol. 10, p. 29, 1904.

3/ Described by S. S. Smirnova

4/ Synonymy and description of types of family Scorpaenidae, see P. A. Moiseev (Exp. Sea, SSSR, vol. 23)

This type was recently described and is distinguished by 14 spines in the first dorsal and a protruding lower jaw and other attributes which were discerned. The TIRH expeditions in 1932 (PALTUS and KRASNOARMEIETZ) took it along the eastern Kamchatkan coast (south of Shipunsky) and at Pribilof Ids. Type (No. 25013 Zool. Inst. Acad. Sci.) a female about 360 measures:

D XIV, 13-1/2 A III, 8. P. 17-18. Ll 48-50. Gill rakers $\frac{12 \text{ plus } 27}{6 \text{ plus } 22}$.

This species is common in the Bering Sea fide P. Y. Schmidt. Trawling at the Pribilof brough catches up to two ton per hour (with S. alutus).

15. Sebastodes alutus (Gilbert)

Two young examples (161 and 162 mm) from Cape Olytorsky at a depth of 142 meters, bottom temperature 1.7°, bottom sand and gravel (DALNEVOSTOTCHNIK) station--(55).

D XIII, 15-1/2-16-1/2 AIII, 8-8-1/2, P 18. Ll 52-53, gill rakers $\frac{10 \text{ plus } 25}{6\text{-}7 \text{ plus } 19\text{-}20}$

Lower jaw protruding but not as much as in adults. Symphasyal knob weakly developed (Fig. 3).

Fig. 3. Head of young Sebastodes alutus (Gilbert) near Cape Olytorsky

16. Sebastodes introniger (Gilbert)

Two adults (male 387 mm and female 515 mm) were caught at Bering Id. with Sebastolobus alascanus at station 70 (59).

D XIII, 13-1/2-14-1/2, A III, 7-1/2. P 19. Ll 32-33, gill rakers $\frac{7\text{-}8 \text{ plus } 20}{4 \text{ plus } 15}$

Occipital ridges parallel and long, about 1/2 diameter of orbit, with spines little developed. Plyoric caeca 10. Diameter of eggs (in stage III of development) 0.58 mm. Color in life a uniform dark red. A dark spot on Ll and pectoral fin.

Family Anoplopomatidae

17. Anoplopoma fimbria (Pallas)

The last years TIRH expedition has discovered in Eastern Bering Sea this species which were caught by trawl at about 50 per hour. Single specimens from Olytorsky Cape. Our example from the Pribilof Id.

D XX, 17 A III, 15 P 17

Total length of largest example (No. 24935 Zool. Inst. Acad. Nauk.) is 644 mm. Second example (LGU) 620 mm. Measurements in percentage of total length. (Second smaller example in parens a male). Head length 25.5 (25.2), predorsal 30.6 (29.5), preventral 28.0 (26.4), preanal 60.6 (59.4), pectoral length 15.8 (15.7), ventral length 10.4 (10.5), greatest depth 18.0 (-), caudal peduncle depth 4.5 (4.7). In percentage of head length, eye 13.4 (13.8), snout 32.5 (34.6), interorbital 30.5 (32.1), upper jaw 40.8 (41.7),. Pyloric caeca numerous, their length equal to upper jaw. Color (in alcohol) dark gray brown, darker dorsally.

Family Hexagrammidae

18. Pleurogrammus monopterygius (Pallas)

The otter trawl caught (July 3, 1932) this form at Piramidsey Id. (south of Avacha Bay) at St. 1, in 96 meters depth on a sandy clay bottom with small gravel. Bottom temperature -0.2°. It is obvious that this form is important in the diet of Treska. (in some stomach as many as 5 examples). According to M. F. Bernidub in 1932, spawning Pleurogrammus monopterygius in Olytorsky Bay were caught at the rate of one ton per hour.

It is common on both coasts of Bering Sea, the Aleutian Islands and Commander Ids., but does not reach Cape Navarin to the north.

Similarly common in Bering Sea is Hexagrammos, which along the Asiatic coast does reach Anadyr Gulf and is only seen rarely; on the American coast reach farther north to Port Clarence and Bering Straits (Bean has indicated the occurence of Hexagrammos stelleri Tilesius from St. Michael and Port Clarence.).

19. Icelus spiniger intermedius Lindberg and Andriashev

Icelus spiniger Jordan & Gilbert (non Gilbert) Fish Bering Sea, 1899, p. 453 (East Kamchatka, 96-100 fath).
Icelus spiniger intermedius Lindberg & Andriashev. Review of the geographical forms of the sculpin Ic. spiniger of the N. Pacific. 1935 M. S.

As was shown recently, this common species may be divided into three subspecies: (Lindberg & Andriashev, 1935)

1. Icelus spiniger spiniger Gilbert - Eastern Bering Sea & Aleutian Ids.
2. Icelus spiniger intermedius Lindberg & Andriashev - Western Bering Sea & Okhotsk Sea.
3. Icelus spiniger cataphractus (Pavelenko)-Northern Japan Sea & Aniva Bay.

In Bering Sea the subspecies intermedius was discovered by us (DALNEVOSTOTCHNIK 1932) in Avacha Bay and off Cape Olytorsky and SE of Cape Navarin at depths of 115-142 meters on sandy clay bottoms at positive temperatures (usually a little above 0°). This subspecies occupies an intermediate position between the typical form of the East Bering Sea Icelus spatula (SIC) and the subspecies cataphractus from the Japan Sea, which forms it replaces ecologically at greater depths. From the former species it differs, as can be judged from Gilbert's description and figure, by the notched pectoral fin and well developed postorbital spines, spine-like elevations on the crest of the suborbital stay, and in the presence of numerous small pricles on the top and sides of the head. From the Japanese subspecies it varies in the simple or serrated (but not saddlelike) shape of the shields (spines) of the lateral line, the lesser depth of the pectoral notch, in an obsolescent preorbital spine, etc.

Below are the measurements of the examples 136-181 mm TL (Bering Sea off Cape Olytorsky) in percentage of SL. Head 30.4-31.3, depth of head 17.4-18.2, head width 18.8-18.9, longest ray, upper pectoral lobe 22.6-23.2, longest ray, lower pectoral lobe (7th ray) 26.1-26.3, shortest (lowest) ray of upper pectoral lobe 21.6-22.6 (in examples from Okhotsk Sea 19.8-20.9, in Icelus spiniger cataphractus from Japan Sea 17.7-20.9). In percentage of head length: Occipital spine length 8.8-9.0 (in examples from Okhotsk Sea 10.7-11.3), orbit 33.0-34.4. The height of the caudal peduncle in percentage of its length 23.1-25.0. Fin formula:

D IX, 21-23 A 16-18 Ll 42-45 First row spines 28-32

20. Icelus uncinalis uncinalis Gilbert & Burke

Icelus uncinalis Gilbert & Burke, Fishes of the Bering Sea and Kamchatka, 1912, p. 39, figs. 2, 2a

Icelus uncinalis uncinalis Andriashev "Neue Angaban uber systematic und geographverbreitung des zweihorn pazifiscen Icelus arten. Zool. Jahr. 1936 in press.

The typical form of Icelus uncinalis Gilbert & Burke was taken in north eastern Kamchatka (off Cape Africa) and the coast of Koriak land (to 61°N). In reviewing the Pacific species of two horn Icelus, I find the following forms:

1. Icelus uncinalis uncinalis Gilbert & Burke--Bering Sea
2. Icelus uncinalis crassus Andriashev, subsp. nov. - Okhotsk Sea
3. Icelus uncinalis stenosomus Andriashev subsp. nov.-N. Japan Sea
4. Icelus uncinalis spatula ochotensis Schmidt.-Okhotsk Sea, region of Shantar Ids. and Iona Id.
5. Icelus spatula bispinis Andriashev subsp. nov.-Okhotsk Sea
6. Icelus spatula spatula Gilbert & Burke, see below

21. Icelus spatula spatula Gilbert & Burke

Icelus spatula Gilbert & Burke, 1912, l.c. p. 41, fig. 3. 3a (Avacha Bay, 58
Icelus Karaensis Soldatov, Tr. Plov. Morsk. Inst. Vol. 3, 1923, p. 31 fath)
Icelus bicornis beringianus Schmidt Ann. Mus. Zool. Acad. (Kara Sea) Sci. URSS, vol. 28, 1927, p. 7. (Tkaken Bay, N. Bering Sea.)
Icelus spatula spatula Andriashev, 1936, l.c. (Synon.)

This form is widely distributed in the arctic sea from Novaya Zembla to the Chukchi Sea and probably Greenland; in the Bering Sea south to Avacha Bay. Our specimens (over 200) are from the Northern part of Bering Sea and the Chukchi Sea from depths ranging from 20 to 130 meters (usually 50-70 meters) and temperatures around 0° (usually -0.8° to 2.8°) on rocky bottoms, or with a mixture of gravel. They were much rarer on sand and clay bottoms. The analysis of distribution can be found in my works referred to above.

22. Stelgistrum beringianum Gilbert & Burke

Stelgistrum beringianum Gilbert & Burke, 1912, l.c., p. 52, fig. 9 (Petrel Bank, Aleutian Ids., 43-52 fath); Andriashev, Zool. Anz., 1935, vol. 111, heft 11/12, p. 290, Cape Olytorsky, 32-34 meters, synon.).

This species was described(by Gilbert & Burke) from the Aleutian Ids. and is also known from Bering Id. (T. Bean & B. Bean, 1896 as Artedius lateralis). It was recently found off Cape Olytorsky (A. Andriashev, 1935). In the Okhotsk and

Bering Sea it is absent, being replaced by the well known S. steinegeri Jordan and Gilbert.

D IX, 18-19 A 12-13 P 16-17 Ll 39-41 (in 5 examples)

Head small, about three times in SL. Top of head with three pair of well developed cirri. Upper jaw long, reaching a vertical from middle of eye and almost to posterior edge of eye, 17.0-19.2% L. There is one small cirrus on the nasal spines and supraorbital. A row of shield spines, dorsally to the larger spines do not reach the end of the second D, leaving the caudal peduncle bare. Bristles on back decrease toward the head and dorsal fins reaching only to top of head, sides of head and cheeks bare, as are the snout and 1st and 2nd dorsal rays. Anal fin of female light, males with two rows of small spots.

23. Stelgistrum concinnum Andriashev (fig. 4).

Stelgistrum concinnum Andriashev, 1935, l.c., p. 292, fig. 1 (Cape Olutorsky, 32 meters)

D IX, 19 A 14 P 14 Ll 42 (in type)

Head small (39% L) with an abrupt profile, mouth very small, horizontal. Upper jaw not (page 303) quite reaching vertical from front of eye and measures 12.6% L. Four pair of cirri on top of head, no spines or bristles on supraorbital. Sides of head, snout and fin rays naked, as in S. beringianum, but dorsal rows on back of two distinct linea reaching almost to end of caudal peduncle. All three examples from Cape Olytorsky from depths of 31-32 meters and temperatures of 3.2° on rocky bottom.

24. Triglops beani Gilbert

Triglops beani Gilbert Rept US Fish Comm 19, 1896, p. 426 pl. 28 (Aleutian Ids., Bristol Bay)

? Triglops ommatistius terraenovae Gilbert Proc USNM, vol. 44, 1913, p. 467 (Newfoundland, 39 fath)

? Triglops pingeli pacificus Schmidt Ann Mus Zool. Acad Sci URSS, 1929, p. 515 (fig. 1a, 2c (Bering and Okhotsk Seas)

Very common in the Bering Sea to depths of 25 to 104 meters (less often to 130 meters). Usually found on rocky or gravel bottoms and in a wide range of temperatures -1.7° to 3.8° (usually a little above 0°). In the Chukchi Sea rare--among my material (DALNEVOSTOTCHNIK, 1932 and KRASNOARMEIETZ, 1933) we found only one young from Cape Unimark. The considerable material available shows much variation in the snout, depth of the caudal peduncle, number of lateral folds and in a number of other characters. Among variations of this species I

Figure 4. Stelgistrum concinnum Andriashev, type from off Cape Olytorsky

consider those examples with a short and blunt snout to be closer to the subspecies described by P. Y. Schmidt (1929) as Triglops pingeli pacificus from the Bering and Okhotsk Seas. It is perhaps too early to delimit its distribution as the former researchs by (P. Y. Schmidt 1929, and others) do not include the subspecies Triglops ommatistius and T. s. terraenovae, described by Gilbert from the Atlantic coasts of North America.[1/] These two forms are related to each as the T. beani Gilbert and T. metopias Gilbert and Burke, (the main differences lie in the number of lateral folds) and are very close to T. beani from the Pacific Ocean, which complicates the systematic position of T. beani and T. pingeli Reinhardt.

One may suppose that the common and numerous forms are subject to a number of changes and morphological change to other types (whose ecology is unknown) in different water masses. For example forms close to the typical T. beani (an elongate body, long and sharp snout, etc.) are common in the Pacific ocean, but close to them are some North Atlantic forms (no. 1932 Akad. Nauk. from Greenland and T,. terraenovae Gilbert). The typical T. pingeli is common in the North Atlantic but is represented in the Bering Sea (T. pingeli pacificus). To some extent there are similar changes in the number of lateral folds (if one compares T. metopiae Gilbert and Burke with T. omatistius Gilbert), by having an increased number.

In part the facts need not be explained on the basis of parallel evolution or formation if it is presupposed that T. beani, as in the case of Icelus spatula spatula Gilbert and Burke, occurs from Bering Straits to Hudson Bay and Greenland.[2/]

1/ In studying the Greenland type of Triglops we must consider Triglops pleurostictus Cope, (1865) (usually placed in the synonmy of T. pingeli Reinhardt) and some others described previously from the North Atlantic Ocean.

2/ It is interesting to note that V. Vladykov (1933) showed that Triglops pingeli pingeli occurs in Hudson Bay (on the basis of the caudal peduncle length in the body, 2.6 - 2.9%, instead of 3.3 - 4.4% for the Atlantic form).

25. Triglops scepticus Gilbert

This form ecologically replaces Triglops beani at depths greater than 120 meters. It was found on the ridge of Avacha Bay from 114-134 meters and 150 m.; off Cape Olytorsky at 142-120 meters on sandy clay and sandy bottoms at bottom temperatures of 0.2° to 1.7°.

Our examples fully agree with Gilbert's description of this species.

One may mention a number of characters which indicate life at relatively great depths on shallow clay bottoms. The fish have weak and tender anal fins, body covered with spinelike bristles which offer good protection from the sediment and hide the fish. Color uniform with hardly distinguishable rudimentary lines (color is unnecessary to a fish covered by clay), enormous eyes and other attributes.

Distributed in the Bering Sea from 100 to 250 meters, never occuring north of the Anadyr - St. Lawrence cold shallow waters.

26. Melletes papilio (Bean)

Melletes papilio Bean Proc. U.S. Nat. Mus. 2, 1880, p. 354 (St. Paul Id.).
Hemilepidotus gilberti Schmidt (non Jordan & Starks) Ann. Mus. Zool. Acad. Sci. URSS 30, 1929, p. 364 (in part Tkachen Bay, juvenile).
Neohemilepidotus japonicus Sakamoto Jour. Imp. Fish. Inst., Tokyo, 27, 1932, p. 4, fig. 2 (no definite locality).

This species is described from the work of the DALNEVOSTOTCHNIK (1932) and KRASNOARMEIETZ (1933) as very common in Northern Bering Sea, occuring from the coasts of Koriak Land, Anadyr Gulf to Bering Strait, one example from Krustern Id. (DALNEVOSTOTCHNIK Sta. 27 (20)). It occurs at depths of 25 to 104 meters. Usually on gravel and rocky bottoms, seldom sand. It is absent from clay bottoms. Temperature range wide (from -1.2° to 5.5°) but most common at higher temperatures found south of Anadyr Gulf, described as Hemilepidotus jordani Bean in an unnotched 1st D, five rows of scale-like papilla (but not round plates as in the type of the genus Hemilepidotus (Cuvier) that occur below the lateral line and well developed short ridges on the occiput.

With the genus Melletes Bean must be synonymized Neohemilepidotus japonicus described by Sakamoto (1932, location unknown). The two adult examples do not differ from the limits of Melletes and are close (if not identical with) M. papilio Bean.

27. Hemilepidotus jordani Bean

In our collection are young examples (to 145 mm. long) from Natalsky Bay and from SW part of Anadyr Gulf. Schultz and Welander (1934)[1] found differences between H. hemilepidotus Til. and H. jordani Bean by comparing the total number of rays in the 2nd D, anal and both pectoral fins. The former has an average of 65.46 (in 89 examples)and a range of 63 to 68, whereas in H. jordani the number is higher, 73.32 (in 133 examples) with a range of 71 to 78. In our collection of 5 examples this mean value checks, our variation is 72 to 74[2] which agrees with the data given by the aforementioned authors.

28. Enophrys diceraus (Pallas)

A single example of this species was discovered by the KRASNOARMEIETZ (1933) off Cape Olytorsky.

D VIII, 14 A 12 P 17 Ll 36

In this species the preopercular spine is long, 21.6% of the SL and in addition has four large hooks. The nasal ridges are high and compressed, their length 9.0% SL, not including the tublercles. Distance from posterior edge of pupil to posterior end of nasal ridge 19.8%.

Interorbital narrow and deep, its width 6.3%. The two preorbital spines not sharp as in typical E. diceraus (Pallas) from Avacha Bay. The spine-shields between the soft dorsal and body row of tubercles covered with fine sparce spines. Color is interesting[3] Across the body no dark bars. Entire body an intense red-purple, with a milk white reticulated design. Unpaired fins light and weakly pigmented.

TL is 132 mm. SL is 111 mm. In many characteristics approaching E. lucasi Jordan & Gilbert[4] from the Eastern Bering Sea and to some extent appears intermediate between it and E. diceraus (Pallas).

1/ Journ. Pan-Pacific Res. Inst. 9, no. 2, 1934, p. 5.

2/ The last split ray of 2nd D and A counted as one according to Gilbert & Burke (1912).

3/ The colors from a watercolor sketch by N. N. Kondakov.

4/ Evermann & Goldsborough (Bull. Bur. Fish, 25, 1907, p. 305). E. lucasi and E. diceraus are similar, however, later authors (Gilbert & Burke, 1912, p. 56; Rendahl, Ark. f. Zool., 1931, no. 18, p. 39) have compared the forms and find sufficient reason to maintain them as distinct. On the contrary the large differences found in the Japanese E. namiyei Jordan & Starks are thought to male sexual characters (cf. Rendahl, 1931, no. 18, p. 46).

29. Myoxocephalus stelleri Tilesius

One young example from Medni Id., collected in the littoral at low tide by E. Kardakova. D VIII, 15 A 12 P 17.

30. Myoxocephalus niger (Bean)

One example from Prebrazhensky Bay on Medni Id. by E. Kardakova in early March under rocks in the littoral area at low tide. D VIII, 16 A 12 P 17. Small fine cirri are numerous on occiput. Longest behind eye and on occiput. Interorbital narrow about 1/2 diameter of eye. Upper occipital spine about 3/4 diameter of eye. Color varies with bottom (black lava, grey slates, etc).

31. Myoxocephalus polyacanthocephalus (Pallas)

This species is adapted to the upper region of the sublittoral and was found by us only in shallow water near the coast. Taken in small nets or washed up on the beach in Avaĉha Bay. Absent from trawls in deep water.

32. Myoxocephalus verrucosus (Bean)

In the collections of the DALNEVOSTOTCHNIK (1932) are a considerable number of this species from the north part of Anadyr Gulf, Chukchi Sea and Bering Sea. Examples in the Academy of Sciences SSSR indicate that this species is common as far south to the Karagin Ids. and Okhotsk Sea (near Iona Id.).

Number of rays in the fins of examples 140 to 150 mm. in length.

Myoxocephalus verrucosus North Bering Sea	ID			IID			A		P	
Number of elements	IX	X	XI	15	16	17	13	14	17	18
Number of examples	1	9	5	3	9	3	7	8	2	13

Examples from Karaginsky Id. (No. 21955 Ak. Nauk. SSSR), examined by P. Y. Schmidt (A revision of the genus Myoxocephalus, 1929, p. 415) and assigned to a new subspecies M. verrucosus ochotensis with D X, SI, 16, 17, A 13, 14, P 17, 18 (2 ex.). These and other characters require these specimens to be synonymized with M. verrucosus (Bean). M. verrucosus ochotensis Schmidt is justly considered a separate subspecies on the basis of examples with 11 anal rays (in 5 examples studied by Schmidt). To M. verrucosus (Bean) must be included an Okhotsk Sea

example from Iona Id. (No. 21959 Ak. Nauk SSSR), which was described by P. Y Schmidt (1929, p. 414) as Myoxocephalus tuberculatus but shows no difference from the former form. Its fin formula D X 16, A 14, P 17.

The nature of the head tubercles is varied but still must be considered the important characteristic for M. verrucosus (Bean) It usually has two high blunt tubercles behind the eye, in addition to 1-2 tubercles of smaller size. The occipital tubercle varies in form, usually compressed and with an additional tubercle in front with which it is sometimes fused to form a single compressed high tubercle. In some examples the tubercles are weaker. Our examples have no cirri on head or tubercles. Occipital and interorbital covered by tubercles without pores. Scapular spine sharp; three preopercular spines, upper short 3/4 of eye (in M. ochotensis Schmidt equals the eye). Above lateral line are round bony plates covered with small teeth. In examples of 140 mm. the plates are already well developed. Adult examples have inner surfaces of pectoral and ventral fins with bony tubercles. Color not always similar. In some males it is very bright, consisting of 3-4 dark, wide bars. Sometimes a dark bar on the nape across the occipital. Abdomen is light without spots. Fins light with a dark irregular line. Ventrals are very light, sometimes with two dark perpendicular lines.

Numerous hauls in the north part of Bering and Chukchi Sea indicate M. verrucosus is the most characteristic and common in comparison with members of the genus Myoxocephalus.

33. Myoxocephalus axillaris (Gill)

In the catches of the KRASNOARMEIETZ (1933) there is a single large example of this species from (Imatra) bay Gluboka on Koriak Land (depths 40 meters, rocky bottom. Temperature 0.4°). D X, 17 A 13 P 17.

TL 190 mm. Tubercles behind eye and on occiput covered with thick skin and have well developed cirri. Above lateral line are bony plates. Probably to be identified with this species are a few young from Anadyr Gulf, that have well developed cirri but undeveloped tubercles (however they have more rays in the pectoral fin). M. axillaris is close to M. verrucosus and the young are difficult to distinguish.

34. Porocottus bradfordi albomaculatus (Schmidt)

Four examples do not differ from the original description were caught by E. Kardakova (April 4 and May 20, 1931) on Medni Id. in tide pools.

35. Dasycottus settiger Bean

In the region of Avachin gulf (DALNEVOSTOTCHNIK, 1932 st. 1 and 74 (60)) this species was obtained twice, at 96-134 meters, temperature -0.2° to 0.2°.

36. Malacocottus zonurus Bean

Malacocottus zonurus Bean, Proc USNM 13, 1890, p. 43 (Trinity Id. Alaska 159 fath).
Malacocottus derjugini Popov Explor. Sea SSSR, 1931, vol. 14, p. 130, pl. 1, fig. 3 (Okhotsk Sea, 287 meters).

In our collections there is but a single young example 25 mm. in TL from Bering Id. (DALNEVOSTOTCHNIK, 1932, st. 5) from 200 meters which we identify with this form.

D VIII, 16 A 12. Measurements in percentage SL; Head 42.7; depth of head equals body depth, 33.3, predorsal 38.9, preventral 35.2, preanal 63.0, pectoral length 33.3, ventral length 13.7, first dorsal base 31.5, second dorsal base 27.8, anal base 25.9. In percentage of head length; eye 33.1, snout 24.4, upper jaw 52.2, lower jaw 53.9.

Occipital and dorsal portion of opercular covered with small cirri. Head, body and first dorsal covered with flabby skin. Soft dorsal connected with spinous dorsal by a membrane, fin high, posteriorly. Rays of dorsal posteriorly (and anal) elongated. The pectoral fin is large and reaches beyond anal fin.

A wide dark band crosses the body at origin of second dorsal, other parts of body light, partly transparent.

37. Psychrolutes paradoxus Gunther

Four examples of this common north pacific boreal type were caught off Cape Olytorsky at depths of 64 meters, temperature 2.8° on shallow gravel bottom. D IX, 17 A 13. Pyloric caeca 4, fat and short. Males have fine conic anal papilla about 3/4 diameter eye, already well developed in a 37 mm. example. The eggs are large and numerous. The diameter of the eggs 1.4 mm. (average of 10 eggs).

38. Zesticelus profundorum (Gilbert) (Pl. 1, fig. 13)

This form is known from California (Santa Barbara) to the Aleutians (as far east as Agattu) at great depths (700-1200 meters). So far absent in

Okhotsk Sea. On the east coast of Japan (south of Tokoyo) it is represented by the closely related Z. bathybius (Gunther). Our example from Avacha Bay from about 1000 meters (DALNEVOSTOTCHNIK, st. 3).

D VI, 11 A 10 P 18 Ll. 16-18.

Total length 47 mm. In percentage of body without caudal, depth of body 21.1, head length 36.8, predorsal 38.2, preventral 30.3, preanal 55.3, depth of caudal peduncle 6.1, pectoral length 31.6, ventral length 14.0. In percentage of head length, snout 25.0, eye 16.4, length of preopercular spine 37.8, upper jaw 37.2, lower jaw 44.3.

Upper preopercular spine slightly curved, long, just touching gill cover End of spine not covered with skin. No hooks on spine shaft (as in Z. bathybius (Gunther)). A pair of short adherent posterior pointing spines on nape. A short scapular spine. Nasal spines undeveloped. Lower jaw sharply protruding. On upper jaw extending to preopercle are six large sensory pores. Smaller pores around eye and on interorbital. Four large pores on lower jaw, anterior pair united into a single larger one. Large pore below each preopercular spine. Above the LL pores are smaller and irregularly placed pores. Small teeth on jaws, weak on vomer and none on palatine. Color a uniform gray without spots or bars, darker below. Fins dark.

39. Artediellus pacificus ochotensis Gilbert and Burke

In Bering Sea reported by P. Y. Schmidt (1927, p. 3) to 61° 08' N and by A. Y. Taranetz (1933, p. 70) in the southern part of Anadyr Gulf. Our examples from Imatra Bay (North part of Glyubokaya) and in southern part of Anadyr Gulf (Cape Ginter) at depths of 40-81 meters, on sand, temperature 0.3 to 2.1°. Absent in northern part of Anadyr Gulf.

P 20-23 LL (25) 27-29

Nasal spines blunt, hidden in skin, but developed. Skin of top of head smooth without tubercles. Pores behind eye and on occiput well developed with raised edges. Cirri on occiput, behind eyes, opercular, preopercular and angle of lower jaw but more weakly developed in the examples from Avacha Bay and regions further south; which bring that material slightly closer to A. pacificus from the eastern Bering sea.

40. Artediellus miacanthus Gilbert and Burke

In the collections of the DALNEVOSTOTCHNIK are two examples from SE of St. Lawrence Island at Sta. 43 (36) and from Anadyr Gulf at Sta. 57 (49) on sandy

bottoms, in depths of 33-81 meters in temperatures a little above 0°.

Our examples are without nasal spines. Skin on head smooth, pores little developed, cirri almost completely obsolescent. No tubercles on occipital. Ll with 21-22 pores.

This form is known from the Okhotsk Sea and Western Bering Sea. Absent in Anadyr gulf and to the north. In the Japanese sea probably replaced by a similar form described by V. K. Soldatov as Artediellus aporosus.

41. Artediellus scaber beringianus Schmidt

This high-arctic species is very common along the northern coasts of Asia where it is known from the Barents sea to Bering Strait as a subspecies described by P. Y. Schmidt, beringianus from the northern part of Bering Sea (Tkachen Bay). Our collections of the subspecies beringianus Schmidt show that it is common in the Chukchi sea northward (70° 25' N, 172° 10' W, west of Herald Bank) and to the south to Anadyr Gulf and Cape Navarin. Further south it is absent and replaced by the pacific representatives of the genus Artediellus (A. miacanthus Gilbert & Burke and A. pacificus ochotensis Gilbert & Burke).

Common at depths of 31 to 55 meters on sandy clay bottom at negative temperatures or close to 0° (-1.6 to 0.4°). A few examples deviating from the usual form toward A. miacanthus Gilbert & Burke were caught at great depths (to 93 meters) off Cape Ginter and Navarin in higher temperatures (1.7-2.1°).

P 20-23 Ll 25-29.

Nasal spines absent, occipital tubercles low, weaker developed than in typical form. Skin on head granulated with small popillae which occur to I D. Though the granulations vary it is characteristic that they do not extend beyond the first dorsal; often weakly developed as in an example from southern Anadyr Bay wherein the papillae are often absent.

Cirri on head and upper part of body numerous and well developed. A long cirrus always behind the eye; also on skin covering occipital tubercles and posterior to them. Cirri on preopercular, opercular and posterior end of lower jaw. Above LL is a row of cirri which become shorter posteriorly and less branched. Number varies, reaching vertical from end of ID and even to middle of 2 D, but sometimes weakly developed there. In addition to granulations on top of head are pores with raised lips. First dorsal high, ends of rays free and a black spot on posterior end of fin. Some examples have a light line on the nape which reaches to the preopercular spines.

A. scaber, as noted by P. Y. Schmidt (1927, p. 7), is close to A. miacanthus Gilbert and Burke, which it approaches in the absence of nasal spines, but varies in roughness of head skin, presence of occipital tubercles, pores on head and a greater number of pores in the lateral line, and in other characters. Particularly close to A. miacanthus are examples from Anadyr Gulf, which have the occipital tubercles hardly noticeable and the skin just slightly rough. The papillae are small and hardly noticeable as are the pores on the top of head and spines on occipital. The larger number of LL pores (27-29) and general habitus of the sample allow to confidently call it a deviation from the typical form of A. scaber beringianus Schmidt.

42. Artediellus dydymovi gomojunovi Taranetz

Artediellus dydymovi Schmidt Proc USNM 71, 1927, p. 6 (in part, Bering Sea 57° 31' N 163° 17.5' E, 54 fath.).
Artediellus dydymovi gomojunovi Taranetz, 1933, l.c., p. 71 (W sect of Bering Sea N to cape Chuckchi).

This subspecies recently described by A. Y. Taranetz on material of the 1931 and 1932 expeditions is very common in western Bering sea; north of Anadyr Gulf is rare. Single specimens reach Bering Strait (DALNEVOSTOTCHNIK, 1932, st. 23 (17) and 38 (31).). Often found on rocky gravel bottoms near Koriak land (Cape Olytorsky to Cape Navarin). Together with Triglops beani and Icelus spatula spatula composing the basis of the catch. (To 150 examples or more of Artediellus dydymovi gomojunovi in a 15 minute beam trawl haul.) Common on rocky and gravel bottoms but rare on clay and sand where it is found only singly. Temperature range wide (-1.7° to 2.6°; young to 5.8°), but in temperatures below zero only found as single examples.

It is interesting to note that this form, as Icelus spatula spatula produces albino variations. For example, some have white spots on the occiput or two small spots on the preopercular, as we found in 10-15% of total among those from Anastashiya (Korykakay gulf) and in the Anadyr cold spot.

43. Gymnocanthus tricuspis orientalis Schmidt

Gymnocanthus galeatus Scofield (non Bean) Fishes Arctic Alaska 1899 (young, Point Barrow).
Gymnocanthus tricuspis Reinhardt subsp. orientalis Schmidt Ann Mus Zool Acad Sci URSS 38, p. 29, 1927.
Gymnocanthus pistilliger tricuspis Popov, Arct Inst USSR Arctica, 1933, no. 1, p. 158; Rehndahl, Ark. f. Zool. B 22A, 1931, p. 76 (Pitlekaj, 12 fath., 64° 52' N 172° 03' W 18 fath).

This circumpolar arctic form has been split into three subspecies by P. Y. Schmidt. The subspecies orientalis Schmidt is found from the Kara sea east to Bering Straits and is also found in the Bering Sea (61° 06' N 179° 40' E). In our collection are a considerable number of examples found at 27 stations in the north Bering Sea (to south of cape Navarin and Natalie Bay) and through Bering Straits to the Chukchi sea (north to 70° 25' N). Usually on sandy bottoms, less common on gravel; at negative bottom temperatures or close to zero. Considerable range in adults (from 2.2 to -1.7°) and from depths of 30-93 meters, though oftener at 40-60 meters.

G. tricuspis orientalis Schmidt is close to the typical G. tricuspis tricuspis (Reinhardt) from the north Atlantic, but differs in undeveloped tubercles behind eye and on occipital. It has a smaller interorbital (5.7-7.7% of head instead of 7.6-8.7% in examples from the Barents sea). A much broader head and many other small characters. The males are rarer than the females and pistilliform attributes under pectoral are absent (males having only ordinary plates as found in all types).[1/]

G. tricuspis orientalis is the single representative of the genus in north Bering sea (Anadyr Gulf) and appears to be most abundant.

44. Gymnocanthus pistilliger (Pallas)

This species is usually reported in southern Bering sea but also in the north and in Chukchi Sea (Scofield; Evermann & Goldsborough). However, of the many trawls in the north Bering and Chukchi seas in 1931-1935 (some 200 hauls) there isn't a single example of this form. However, a closely related form G. tricuspis orientalis Schmidt was found at almost all stations. G. pistilliger is common in the Japan and Okhotsk seas, eastern Kamchatcha to north of Karaginsky Id. (P. Y. Schmidt, 1927) and in the eastern portion of the Bering Sea. The single example from Avachin bay measures: D IX, 15 A 17, E 18 Ll 40.

The occipital tubercles are well developed. Interorbital slightly granulated but with smooth edges. Pectoral reaching to third anal ray. Ventral not reaching anal fin, but extending behind anus. A female, measuring 178 mm.

1/ The typical bony plates were taken for pistiliform appendages by V. Pietchmann on this basis misidentifies G. tricuspis orientalis as G. pistilliger (Medd. om Gron. 1932, bd. 92, no. 3, p. 21) by error. Also we note fig. 12 that depicts a male G. tricuspis is labeled Myoxocephalus scorpius.

45. Gymnocenthus galeatus Bean (Fig. 5)

Gymnocanthus galeatus Bean Proc USNM 4, 1881, p. 153 (Unalaska Id.)
Gymnocanthus detrisus Taranetz (non Gilbert & Burke) Trans. Far East Br. Acad Sci SSSR. no. 1-3, p. 70 (in part, Olutorsky Gulf, "possibly a complex").

Examples undoubtably of the type are known from the eastern part of Bering sea (Unalaska, St. Paul Id., Acutan Bay, etc). As shown by Gilbert and Scofield, the G. galeatus from the polar sea (Cape Sabine & Point Barrow) is a doubtful record as the latter author had only young examples. On asiatic coasts this species was first found by A. Y. Taranetz in the material of the GGI and TIRH expeditions (DALNEVOSTOTCHNIK, 1932, PALTUS, 1932).

The 9 examples of G. galeatus from Koriak Land measure: D XI, 16-17, A 18-19, Ll 45-48.

As shown by A. Y. Taranetz this form (as opposed to G. detrisus Gilbert & Burke) has the interorbital thickly covered with bony plates; thus the edges are coarse, whereas in the other types the plates never reach the edges. The interorbital measures 6.6-9.6 (10.7% head) and is narrow and concave. Top of head flat, not noticeably elevated as in G. detrisus.

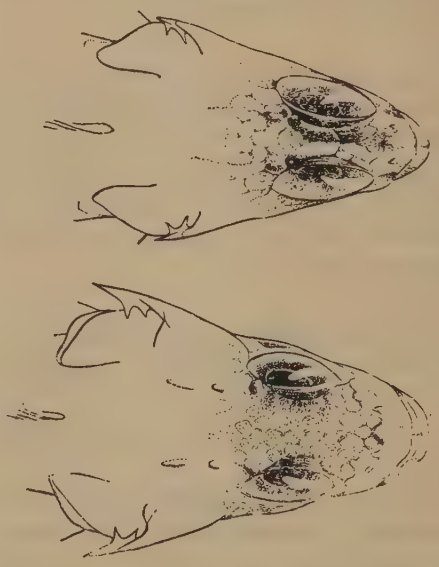

Fig. 5. Gymnocanthus galeatus Bean near Natalie Gulf
Fig. 6. Gymnocanthus detrisus Gilbert & Burke. Avachin Gulf.

46. Gymnocanthus detrisus Gilbert & Burke

Gymnocanthus galeatus Evermann & Goldsborough (not of Bean), Fishes of Alaska, p. 319 (in part, Iturup Is., Kuril)
Gymnocanthus detrisus Gilbert & Burke, Fish Bering Sea & Kamchatak, 1912, p. 61 (west Kamchatka, 25 fath.).

This species is known from the Northern Japan sea and Okhotsk sea on SE Kamchatka (Avachin bay). It is close to the Bering Sea form G. galeatus Bean, but

differs in a wider interorbital, 14-15% of head; a somewhat larger preopercular spine and a rising profile at the nape and fewer LL pores, plus other characters. One example from Avachin bay in our collection measures: D X, 16 A 18 P 20 Ll 42.

Interorbital 15.1%, densely covered with bony plates developed even to edges. Head width 61.2% of its length and equals depth at nape. Preopercular spine 24.0% of head. Close to G. galeatus in the structure of interorbital, but the above differences are so definite, that it must be considered distinct.

V. Vladykov in a review of Hudson Bay forms (Contr. Can. Biol. & Fish., vol. 8, 1933, p. 15) notes a very interesting example of Gymnocanthus which he calls G. galeatus Bean (male, 174 mm). However, the author must be dealing with a form from G. galeatus group but closer to G. detrisus Gilbert and Burke (pre-orbital distance in Vladykov's example is 13.3%). This is surely the case as he synonymizes G. galeatus with G. detrisus, with which action we cannot agree on the basis of our material.

47. Nautichthys oculofasciatus (Girard)

Blepsias oculofasciatus Girard Proc Acad Nat Sci Phil. 9, 1857, p. 202.
Nautichthys oculofasciatus Girard Pac RR Surv 10, pt 4, fishes, 1858, p. 74.
Nautiscus pribilovius Jordan & Gilbert Fishes Bering Sea, 1899, p. 468, pl. 69 (Bristol Bay)

Widely distributed, on both coasts of Bering Sea north to southern part of Anadyr Gulf, (Cape Navarin--Cape Ginter), absent further north. In the east is found further north in warm current of the American coast, found NE of St. Lawrence Id. in 1932 (at bottom temperature 5.5°). Taken in depths of 30 to 126 meters on rocky gravel bottoms at temperatures above zero (0.5 to 5.5°). Probably, as with many other fish, does not go north of the Anadyr-St. Lawrence cold shallow water region, and consequently serves as an indication of warmer waters.

The expeditions of the DALNEVOSTOTCHNIK (1932) and KRASNOARMEIETZ (1933) took this form at 11 stations from Cape Africa (E. Kamchatka) to the southern part of Anadyr Gulf and off NE St. Lawrence Id.

Our material, in which the males possessed high ID and the females low, supported P. Y Schmidt's contention that Nautiscus pribilovius Jordan & Gilbert were only females of the male Nautichthys oculofasciatus (Girard). However, this does not exclude the possibility that a detailed study of pribilovius and oculofasciatus will establish them as subspecies together with many geographical forms of this wide ranging form.

Family Hemitripteridae

48. Ulca bolini Myers

Hemitripterus marmoratus Bean (non Ayres)[1/] Proc USNM 13, 1890, p. 43 (Sitkalidak Id., 69 fath).
Ulca marmorata Jordan & Evermann, l. c. p. 2021; Taranetz, Tran Far East Br Acad Sci SSSR, 1933, no. 1-2-3, p. 71.
Ulca bolini Myers Copeia, 1934, no. 1, p. 44.

This species was described from Kodiak Id. (Sitkalidak Is.) and later found in east Bering Sea. In 1932 first found by the GGI and TIRH expeditions on the asiatic coast of the North Bering Sea near Cape Navarin (A. Y. Taranetz, 1933). Further to the south on the asiatic side it is not known. The only example preserved by the TIRH expedition trawler KRASNOARMEIETZ (no. 24936 ZIN Akad Nauk SSSR), measures:

D XIV, 12 A 13 P 21 Ll 42.

Total length 490 mm; in percentage of total length: Head 29.4. In percentage of head, eye 13.9; interorbital 41.0, length 1st dorsal base 86.1, length 2nd dorsal base 65.3, pectoral length 80.6, ventral length 31.2.

Interorbital wide, almost flat but not concave. Bristles and chin tubercles are less developed.

Interdorsal space small. Color poorly preserved. Reaches to a good size (DALNEVOSTOTCHNIK (1932) example from Cape Navarin is 71 cm).

49. Hemitripterus americanus villosus (Pallas)

Cottus villosus Pallas, Zoo. Rosso-Asiat 3, 1811, p. 129 (E. Kamchatka)
Hemitripterus acadianus Steindachner (non Pennant) Sitzb. Acad. Wien, Bd. 72, 1875 p. 63 (Hokodate, Japan)
Hemiptripterus cavifrons Lockington, Proc. Acad Nat Sci Phil. 1880, p. 233 (Kodiak Id)
Hemiptripterus americanus Schmidt (non Gmelin) fish East Sea, 1904, p. 121, Popov, Copeia, 1933, no. 2, p. 62.

Widely distributed in the north Pacific Ocean, common on East coast of Kamchatka and Alaska (Hemitripterus cavifrons Lockington). The exact northern limit not clear. Material in the Zoological Institute of the Acad. Sci SSSR indicates the northern limit is Cape Karaginsky. The systematic position of the Pacific Ocean form is not established. Jordan and Evermann considered H. cavifrons Lockington

1/ Ayres (Proc Cal Acad Nat Sci. 1, 1854, p. 4, San Francisco) described another fish under this name (Hemitripterus marmoratus) which is now termed Scorpaenichthys marmoratus (Ayres) which is placed in a separate family by American ichthyologists (Jordan, Evermann & Clark, 1930, p. 382). See Myers, 1934, l.c.

close to the Atlantic H. americanus (Gmelin) and "perhaps not distinct from the proceeding". P. Y. Schmidt (1904) synonymized the two forms; Soldatov and Lindberg (1930) following Jordan & Snyder considered as a separate form H. villosus (Pallas) from the Pacific Ocean. However, the majority of writers comparing species with the Atlantic type did not have both forms at once. In the ichthyological laboratory of the Leningrad University is an example of Hemitripterus americanus (from the Smithsonian Institution) from the east coast of North America (coll. 1877, no. 297a) which I compared with examples from the Japan Sea (coll. K. M. Derjugin) and also Avachin Bay (coll. K. A. Vinogradova). After comparing examples of the same size, the following differences were noted:

North Pacific Ocean[1]	North Atlantic Ocean[2]
1. ID (XVI) XVII-XVIII	1. ID XVI
2. Interorbital and occipital region concave.	2. Interorbital slightly concave, occiput flat.
3. Occipital tubercles low distance between anterior and posterior pair is less than 1/3 interorbital (27-32% of interorbital).	3. Occipital tubercles higher, distance between pairs is more than 1/2 interorbital (58% of interorbital).
4. Interorbital in head (to end of opercular) 36.2-37.6%.	4. Interorbital 28.7% of head.
5. Many tubes of LL have integumentary flaps.	5. No. flaps.
6. Cheeks covered with high conical cirri.	6. Cheek cirri sparce and low.
7. Behind postorbital tubercle a small comb-cirris.	7. One pair of low tubercles between eyes and nape.
8. Large conical papillae covering body and abdomen below lateral line. Flaps on head well developed.	8. Body papillae small, head flaps weakly developed.
9. Pectoral length 23.5-24.5% SL.	9. Pectoral fin 31, 9% SL.

[1] Material for comparison: 1 ex from Japan Sea (270 mm); 1 ex Avachin Bay (390 mm).

[2] From ex 297 a from Smith. Inst. from Eastern NA (320 mm).

The above differences are sufficient proof for the existence of the Pacific Ocean subspecies.

H. americanus villosus (Pallas) appears as the last link in an isolated group of sculpins (Hemitripteridae, Jordan, Evermann & Clark, 1930[1/]) possessing a long dorsal, well developed head sculpture, developed flaps, etc. These characters are less developed in the Atlantic species H. americanus americanus (Gmelin). The most primative of the group is the Aleutian faunal representative of the Bering Sea, Ulca bolini Myers.

Family Agonidae

50. Percis japonicus (Pallas)

This species occurs only along the Asiatic coast in the Bering Sea to north of Cape Navarin and the southern part of Anadyr Bay, without entering cold water.

Our examples from eastern Kamchatka (Cape Africa) coast of Koriak Land (Natalie Bay) and Cape Navarin; in the southern part of Anadyr Gulf (near Cape Ginter). From depths 53 to 126 meters on rocky gravel and sand, usually about zero degrees (0.5 to 2.6°). Our examples from 79 to 240 mm.

51. Hypsagonus quadricornis quadricornis (Cuvier and Valenciennes)

Very common along Pacific coast of Asia and America, north to Bering Strait (DALNEVOSTOTCHNIK, 1932, st. 26 (19)). Our examples from Cape Africa, Koriak Land, north part of Anadyr Gulf, (Providence Bay) and Bering Straits at depths of 50 to 126 meters on rocky gravel. A wide temperature range, above and below zero (-1.2° to 2.8°).

The form described by A. Y. Taranetz from the Japanese Sea as Hypsagonus corniger should be considered a subspecies of the typical form. Rehndahl (Ark. f. Zool. 1931, bd. 22a, no. 18, p. 52, fig. 6) has erroneously listed and figured it as Percis japonicus on the basis of a photograph (fig. 6) of a specimen of Hypsagonus quadricornis.

1/ In this work the genus Ulca is erroneously placed in the Ramphocottidae; likewise the genus Eurymen is placed in the Liparidae.

52. Pallasina barbata (Steindachner)

One example from Avacha Bay, 68 mm. long, has cirri less developed than in examples from the Japanese Sea.

53. Leptagonus decagonus (Bloch & Schneider)

Our examples for the central and southern parts of Anadyr Gulf in cold water (bottom temperature 0.5 to -1.7°) on clay bottoms, depth 74 to 91 meters. One example taken by trawl SE of Cape Navarin in 130 meters, temperature 1.9° on clay sand bottom. This form is common in northern seas but absent from the Laptev, East Siberian and Chukchi Sea, thus cannot be termed circumpolar. Doubtfully in the Japan and Okhotsk Sea (Soldatov & Lindberg, 1930, p. 299; Decastris Bay) as stated by the authors. Our examples from 42 to 155 mm.

D VII, 7 A 7 P 16

No cirri on snout, Vomerine teeth absent. Gill membranes connected to isthmus without a fold.

54. Podothecus acipenserinus (Tilesius)

A single example not in the present collection, found in the western part of Anadyr Gulf (KRASNOARMEIETZ, July 31, 1933, st. 17, 63° 42' N 179° 53' W, sand, 48 meters, bottom temperature 0.4°).

D IX, 7 A 8 P 18 Branchiostegals 6

Male, total length 169 mm. Cirri numerous and long on posterior end of premaxillary and lower part of snout. Length of cirri equal almost, diameter of eye. Snout cirri about 2/3 diameter eye. Interorbital 20.0% of head. Head deep, at nuchal spine it is 50.0% the head length. Lateral plates with sharp spines. Peduncle strongly compressed and posterior half does not have spines on plates. Ventral fins light, their length about twice the eye and 41.3% of the head.

Comparison with examples sent by the Smithsonian Institution from Alaska (no. 379 and 6063 Zool. Mus. Acad. Sci. SSSR) shown no differences.

55. Sarritor frenatus occidentalis Lindberg & Andriashev

Sarritor frenatus Jordan & Gilbert Fishes Bering Sea, 1899, p. 474 (off Povorotnaja, southeast Kamchatcha, 100 fathoms).
Sarritor frenatus occidentalis Lindberg & Andriashev, Rev. of the genus Sarritor of the N. Pacific (in press).

This subspecies, from the Okhotsk and western Bering Sea differs from the eastern Bering Sea S. frenatus frenatus (Gilbert) in the larger number of interdorsal plates (4-5 instead of 2-3, rarely 4), and a greater interdorsal distance, 1 1/3 in eye instead of 3/4 to 7/8 according to Gilbert; in the upper part of the pectoral is a large spot (which is absent in typical form). An example identified by P. Y. Schmidt (1904) V. K. Soldatov and G. U. Lindberg (1930) from the Japanese Sea belongs to the Japanese subspecies (S. leptorhynchus knipowitschi Lindberg & Andriashev). Our examples from Anadyr Gulf and Natalie Bay.

56. Sarritor leptorhynchus leptorhynchus (Gilbert)

Odontopyxis leptorhynchus Gilbert Rept US Fish Comm (1893) 1895, p. 437 Alaska Peninsula, 32-59 fath).
Podothecus gilberti Schmidt (non Collett) Fish East Seas, 1904, p. 139 (in part, no. 13027 from Anadyr Gulf).
Sarritor leptorhynchus leptorhynchus Lindberg & Andriashev, 1935, l.c.

In our collections are 10 adults from near Natalie Bay, which in almost all details correspond to Gilbert's description. They differ only in the slightly larger pectoral fin. S. leptorhynchus P. Y. Schmidt (1904) is considered a distinct subspecies knipowitschi Lindberg & Andriashev.

57. Bathyagonus nigripinnis Gilbert

On our coasts this form was first found by Gilbert & Burke (1912) in Avachin Bay at a depth of 628 (SIC)--682 fathoms. Our examples from Bering Id. DALNEVOSTOTCHNIK, 1932, st. 5 and 70 (59) off Cape Yushin at depths of 200-225 meters. Bottom sandy, temperature at st. 70 (59), 2.0°.

A deep water form found to 1000 meters. At the Commander Islands, representatives of abyssal bathyial faunas rises to the lower region of the sublittoral and this form is found along with Albatrossia pectoralis (Gilbert), Sebastolobus alascanus Bean, Lycenchelus camchaticus (Gilbert & Burke), Lycogramma brunnea (Bean), etc.

A total of 13 examples from 90-239 mm. which do not differ from Gilbert's description.

D VI-VII, 6-7 A 7-8 P 15-16 V 1, 2 Branchiostegals 6 Ll 43-44 (45).

Dorsal plates (39) 42-44 (45). Plates of upper lateral row 43-44 (45). Plates between 1st and 2nd dorsal (2) 3-4[1/] (in 12 examples).

1/ Measurements on the proportions and ratios of Bathyagonus nigripinnis, as well as for many other species were made by K. Y. Andriashev, to whom I am grateful.

Body very elongated, depressed through length. Width at pectoral equals or a little more than greatest depth. Snout equal to horizontal diameter of eye and in smaller examples a little smaller. Lower jaw projecting. Suborbital and bones of snout reduced, region covered by a mucus membrane. Lower jaw with large slime pores. Body lighter above, darker below, reaching a blue-black on abdomen, ventral and pectoral and gill membranes. All fins intensely blue-black. (Below follow measurements average and range, in 12 examples.)

Measurements of Bathyagonus nigripinnis from Bering Island
(12 examples)

Character	Average	Range
Total length	-	90-239 mm
in percentage of body length (without caudal)		
Head	21.1	19.0-22.9
Head width	14.1	12.3-16.0
Snout	6.1	5.5-6.8
Eye	6.4	5.6-6.8 (7.7)
Interorbital	1.9	1.6-2.4
Least body depth	9.0	7.6-9.8
Greatest body depth	2.2	1.8-2.5
Peduncle width	2.5	2.3-3.1
Predorsal	29.5	26.2-31.3
Preventral	21.0	19.0-23.0
Preanal	46.4	43.0-49.3
Pectoral length	18.1	16.2-19.9
Ventral length	6.8	5.1-8.5
Base 1st dorsal	14.9	13.2-16.6
Base 2nd dorsal	13.6	12.4-15.3
Anal base	15.7	14.1-17.6

58. Aspidophoroides bartoni Gilbert

This common species of far eastern seas was found in Bering Sea at 8 stations from Avacha Bay to Cape Navarin, not found further north; avoiding low temperatures. Jordan & Evermann record it from 17-121 fathoms. Our examples from 72-146 meters on rocky gravel, rare on coarse sand. Absent from clay bottoms. Common at temperatures above zero (0.5 to 2.6°). In Anadyr Gulf and further north it is replaced by the high-arctic Ulcina olriki (Lutken). On the Atlantic coast of North America this species is replaced by a close form (subspecies?) A. monopterygius (Bloch), which is absent from European waters as are a number of other amphiboreal types.

59. Ulcina olriki (Lutken)

Until recently this species was recorded from Greenland, Barents, White and Kara Seas, but now is known from the Chukchi Sea (Rendahl, 1931, Popov, 1933) and in 1932 was found in Bering Strait and the cold waters of Anadyr Gulf where it is a common and frequent form. We have considerable material (89 examples) of this form from 19 stations in the northern part of the Bering and Chukchi Sea, which allows some analysis of the ecology of this high arctic circumpolar type to be stated. Usually U. olriki (Lutken) is listed as an example of a stenothermal arctic form, found at negative temperatures or close to zero; corroborating its distribution in Greenland, White and Kara Seas and in the eastern portion of the Barents Sea. (K. M. Derjugin "Barents sea on Kola meridian"), 1924. In this respect U. olriki is similar where it is found with other high arctic elements, as Boreogadus saida, Artediellus scaber beringianus, Myoxocephalus quadricornis labradoricus, etc. at low temperatures and absent south of the Anadyr cold spot.

The table below indicates the frequency of U. olriki at various bottom temperatures.

Bottom temperature	-1 to -1.7	0 to -1	0 to +1	1 to 2	above 2	total
Number of cases	36	20	10	8	4(11)[1/]	89
Number with U. olriki	5	3	5	3	3	19

At depths of 31 to 78 meters on rocky and sandy facies, less often on clay.

1/ These 11 examples taken by otter trawl; all others from beam trawls.

To compare these with the Atlantic form, we examined 19 examples from Anadyr Gulf and Chukchi Sea and 20 from the Barents Sea. A comparison of measurements and meristic data show a great similarity in the east and western forms. Examples from the Bering Sea differ chiefly in a rougher and broader body; head with 21.0-25.4% of SL (average 24.9%). In the Barents Sea material (17.1-22.5, average 21.1%). The weakly developed or obsolescent pores on interorbital and nuchal plates are well developed in the western examples. They have fewer spines on lateral row of plates and a larger size and a few other characters which do not serve to separate the forms from the Pacific Ocean and Barents Sea as distinct.

Our examples from 50 to 70 mm.

D 6-7 A 5-7 P 14 (15) Dorsal plates 34-38 (in 19 examples).

Measurements in percent of SL (average of 19 examples)[1/]. Preanal 59.0 (57.2), predorsal 59.2 (57.2), preventral 28.4 (27.2), interorbital 4.6 (5.0) at front edge of eye, head 25.6 (25.2), head width 24.9 (21.1), greatest body depth 16.3 (15.3), depth of caudal peduncle 3.7 (3.4), eye 7.0 (7.3), snout 5.6 (5.8), pectoral fin length 26.6 (25.9), ventral length 10.7 (11.6).

Family Cyclopteridae

60. Eumicrotremus orbis Gunther

Very common in north Pacific Ocean, occuring north to Chukchi Peninsula. The northernmost records, between St. Lawrence Id. and Chukchi Peninsula (DALNEVOSTOTCHNIK 1933, Sta. 25) where it is not uncommon. Absent in Japan Sea. Found on hard facies (rocky and gravel). Very seldom on sand. Depths of 20 to 75 meters. Temperature tolerance wide, often considerably above and below zero. Our examples (from 10 stations) were found in temperatures ranging from 2.0 to -1.7° Young examples are found at higher temperatures (to 3.2°). On August 26, 1932, 35 young were found between Chukchi Peninsula and St. Lawrence Id. They measured 29 to 40 mm (average 34 mm). Young were found at the same period in Providence Bay (in Emma Bay). Adult examples measure 55 to 75 mm; no halfgrown were found in the summer. In a 57 mm example we distinguished two winter rings in the otoliths.

D VI-VII, 11-12 A 10-11 P 24-26.

1/ In parentheses are the range of Barents Sea material, averaging up to 20 examples (No. 1804, 10451, 10452, 10453, 11132, 11371 and 17786 of Zool. Mus. Akad. Sci. SSSR).

Tubercles on body of unequal size; their distribution and character corroborate this variation. Usually there are four main rows of tubercles between which are the smaller. All tubercles possess spines, but fewer than in E. birulai. In an Anadyr Gulf example there are 5-7 suggested raws in the preorbital distance, some tubercles small and in no order. Between the first and second dorsal are one or two very different tubercles.

Fig. 7 Eumicrotremus orbis (Gunther) juv. from between St. Lawrence Id. and Cape Chaplin

Fig. 8 Eumicrotremus birulai Popov juv. near Natalie Gulf

(The number is not fixed at two as stated by A. M. Popov (1928, pp. 10, 11)). One example from this locality had only one (from two fuzed) tubercle. Chin covered by small low tubercles and have well developed papillae. First dorsal low with distinct rays which are covered by low and randomly distributed tubercles, of spine like shape. Anus placed at posterior end of disk not more than at a single eye diameter's distance.[1/] Length of nasal tube varies widely and cannot be employed as a systematic character. In our collection there are both extremes.

The one year old examples (35 mm) have the tubercles of the main rows developed but with only a few spines (fig. 7).

This species is closest to E. spinosus (Muller) from the North Atlantic. It is absent in polar seas. The distribution of these species is amphi-boreal to each other.

1/ In the material from anadyr Gulf and from Koriak Land are numerous examples that deviate toward E. birulai. Possibly the two species are found in this region and hybridize with the main characteristics of E. orbis being dominant. However, the possibility that a detailed study will show these forms to be a particular form of E. orbis is not to be excluded.

61. Eumicrotremus birulai Popov

Eumicrotremus orbis Schmidt (non Gunther), 1904, l.c., p. 154 (in part no. 12915).

Eumicrotremus birulai Popov, 1928, l.c., p. 2, illust. (Okhotsk Sea and Avachin Bay) Soldatov and Lindberg, 1930, l.c., p. 134.

This species is known from the Japan and Okhotsk Seas and Avachin Bay.[1] A. M. Popov[2] lists this species from the Kara Sea (68° 58' N 72° 24' E) (Vaygach, 1912) on the basis of seven young. However the author does not present data by which it may be identified as E. birulai and establish the paradox of distribution of the warm water type in the north polar sea. The DALNEVOSTOTCHNIK expedition (1932) found this species only as far north as southern Anadyr Gulf, in contrast to E. orbis. (North of Anadyr Gulf one only finds E. orbis).

E. birulai is common at depths of 46 to 104 meters on rocky gravel and sand. It occurs at higher temperatures than E. orbis, usually close to zero or above.

The presence of tube-like papillae on the chin places this species in the E. orbis (Gunther)[3] group primarily, but it differs from it in a series of characters as follows:

1. First dorsal low, base and anterior section covered with thick skin.
2. Body covered with low conical shaped tubercles, almost equal in size. Tubercles gradually smaller posteriorly (in E. orbis tubercles change size abruptly posteriorly).
3. Tubercles around anal ring on abdomen equally small, the two large tubercles at base of anal fin absent (present in E. orbis).
4. Body more globular than in E. orbis and a much more abrupt snout.
5. Distance from disk to anus larger, about two times or more the eye diameter (in E. orbis it is usually only equal to the eye, or less).

Although they vary greatly, these characters allow the identification of both young and adult without doubt. In our collection are young examples (30 to 40 mm) taken in a trawl at Natalie Bay (Koriak Land, 61° N) in late July. These young differ from young of E. orbis from the Chukchi Sea in the greater number of spines on the body and larger eye, in addition to the above characters.

1/ E. birulai was erroneously omitted from A. M. Popov's list of fishes of Avacha Bay (Copeia, 1933, no. 2, pp. 59-67).

2/ "Arctica". Arctic Inst. USSR, 1933, no. 1, p. 161.

3/ To this species group, which is characterized by the presence of papillae on the chin, also belong E. spinosus (Muller), E. orbis (Gunther), and E. birulai Popov. Closer to this group which has pores on the chin is E. derjugini Popov, from the Barents and Kara seas, and the Hudson Bay (Vladykov, 1933), and in the form of the subspecies ochotensis Popov from Japan and Okhotsk Seas. Unknown in Bering Sea.

62. Aptocyclus ventricosus (Pallas)

The common species of the littoral of Avacha Bay. North on the Asiatic coast (according to A. Y. Taranetz) to Korf Gulf. In the Commander Ids. (common local name "Myakonkaya") according to E. F. Guryanovoya[1] it appears on the littoral in early March. It is seen in great numbers in April and serves as food for birds, fox and fur seals. Until this period it is found in deeper waters and only in spring it migrates into the littoral for spawning. According to K. A. Vinogradova (in Avacha Bay) spawning is done on the tidal flats and after spawning a great mortality occurs among females. The males "sit on the eggs" and remain on the tidal flats during ebb tide, not regarding the preying birds. Spawning, growth of eggs and young occur under conditions which are easy to study and make ecological-embryological research most desirable.

Family Pleuronectidae

63. Atheresthes stomias (Jordan & Gilbert)

Found commonly in Bering Sea (Priblov Ids. and further north) by the TIRH trawler KRASNOARMEIETZ in 1932, at depths of 70 to 300 meters, at high bottom temperatures (2 to 8°). The examples available (about 460 mm long) are poorly preserved, salted material, making systematic description difficult.

In the eastern part of Bering Sea it is valuable to the commercial trawl industry.[2] West of St. Matthews Island it is replaced by the common asiatic coast species A. evermanni Jordan & Starks.

64. Atheresthes evermanni Jordan & Starks

The asiatic arrowtooth paltus is known from Japan and East Sakahlin. The TIRH activities found it in the Okhotsk and Bering Seas. Its northern limit is south Anadyr Gulf and the Anadyr-St. Lawrence cold shallow waters (the same limit for the other three paltus'). On Commander Id (PALTUS, 1932) and more common east of Matvi (St. Matthew) Island on the American coasts it is replaced by A. stomias. The DALNEVOSTOTCHNIK (1932) expedition found it in Avacha Bay (st. 2, 10 examples, and 74 (60), 3 examples) and SE of Cape Navarin (st. 59 (51), 1 example).

1/ Priroda (Nature), 1935, no. 11, p. 72.

2/ According to M. F. Vernidub, up to 300 per hour's trawling are found in Bering Sea.

Measurements of 10 examples from st. 2 (July 14, 1932, 150 meters, clay bottom with some gravel, temperature -0.3°) follow:

Table of measurements on A. evermanni from Avachin Bay

	1	2	3	4	5	6	7	8	9	10
Total length	680	670	670	670	670	650	640	580	540	460
Greatest depth	235	238	220	230	240	215	205	180	165	155
Sex	F	F	F	F	F	F	F	F	M	F
Degree of sexual maturity	III-IV	III-IV	III-IV	III-IV	IV	III-IV	III-IV	III-IV	III	II

Average length of those measured 61.60 cm. Average depth 20.83 cm. stomachs in all examples empty. One paltus contained a Clupea harengus pallasi 30 cm. long. This species may be of commercial importance in the trawl fishery

65. Reinhardtius hippoglossoides matsuurae Jordan & Snyder

Hippoglossus groenlandicus Ishikawa & Matsuura (non Gunther) Pre. Cat., 1897, p. 25 (Sagami Bay)

Reinhardtius matsuurae Jordan & Snyder Jour. Coll. Sci Imp Univ Tokyo, 15, 1901 p. 309, pXVI, figs 7-8 (after Ishikawa and Matsuura specimen), Jordan & Starks, Proc USNM 31, 1907, p. 196 (after Jordan & Snyder), Norman 1934 p. 290.

Reinhardtius hippoglossoides Taranetz, 1933, l.c., p. 74 (Bering & Okhotsk Sea)

The black paltus until recently was known in the Pacific by a single example from Sagami Bay (Pacific coast of Japan), which was described as a new species, H. matsuuras by Jordan and Snyder. However, in 1931-1933, the black paltus, probably identical with Japanese examples, was found by the TIRH and GGI expeditions in the Okhotsk and Bering Seas in great numbers (A. Y. Taranetz, 1933). In the Okhotsk Sea it occurs in many places; in Bering Sea in a limited area between Cape Navarin and St. Matthew. In these regions, K. I. Panin, who studied the different relation of Atlantic and Pacific subspecies of black paltus, obtained as many as 200 examples of various ages of this rare form by otter trawl at depths to 250 meters. Our examples, from 110 to 830 mm. were caught in this region at depths of 110 to 130 meters. Adult females in the four stages of sexual maturity (=year class) had larger, light transparent eggs in September. In the stomachs were young mintai (T. chalcogramma). Rays in five females: D 87-94; A 66-71.

The black paltus is tasty and may become of value in the commercial trawl fishery in the Okhotsk and Bering Seas.

66. Hippoglossus hippoglossus stenolepis Schmidt

Widely known in the Pacific Ocean on both coasts of the Bering Sea, Commander Ids. and north to the commonly southern portion of Anadyr Gulf; in the shallow and cold regions (central and north part of Anadyr Gulf) it is rare. The KRASNO-ARMEIETZ (1933) expedition found only one example 66 cm. long at st. 1 (SE of Cape Navarin, 104-99 meters, on sand, temperature 0.4°). The TIRH expedition found it common and in almost commercial numbers in the east and west parts of the Bering Sea. Very closely related is the white skinned paltus (H. hippoglossus[1/]) from the Atlantic Ocean and possibly, as considered by M. F. Vernidub, only as its subspecies.[2/]

67. Hippoglossoides elassodon Jordan & Gilbert

Examples of this many rayed and numerous papillied representative of the genus Hippoglossoides were found at Bering Id.

1. DALNEVOSTOTCHNIK Sept. 20, 1932, St. 69 (58), 55° 21' 9N, 165° 58' E (one mile north of the seal breeding grounds) depth 55-70 meters, rock, one example A. Andriashev.

2. DALNEVOSTOTCHNIK Sept. 20, 1932, St. 70 (59), 52° 24' 7N, 165° 44' E (west of Cape Ushin and Bering Id) depth 200-235 meters, sand, temp. 2.0°. Eight examples A. Andriashev.

Total length of our material 105 to 375 mm.

D 79-86 A 63-67 Gill Rakers 4 plus 16-19 (eyed side).

1/ Tanaka in 1931 published his "Distribution of fishes in Japanese waters" (Jour. Fac Sci. Univ. Tokyo, sect. 4, vol. 3, pt. 1, 1931). In this work under his list of fishes of northern character is listed Reinhardtius matsuurae in the synonymy of R. oleosus Tanaka. Tanaka's description of this form was unavailable to me. We consider his R. oleosus as the second record of the black paltus for Japan. But his work is full of uncritical lumping and error. In short descriptions for example we learn: Cyclopterus lumpus L (=Cyclopterus orbis Gunther = Cyclolumpus asperrimus Tanaka); Reinhardtius matsuurae Jordan & Snyder (=Atheresthes evermanni Jordan & Starks); Annarchias fasciatus Bleeker (=A. leprurus Bean); Enhelyopus elongatus Kner (=Krusensterniella notabilis Schmidt = Zoarcea gilli Jordan & Starks) etc.

2/ The present work does not treat the systematics and biology of the Pacific Ocean paltus, as it is being studied by M. F. Vernidub (LGU).

Teeth on jaws small, no larger teeth noticeable. A tubercle on anterior part of lower jaw protrudes noticeably. Premaxillaries are very curved, thicker in front. Preorbital distance very narrow, particularly in young, forming a sharp ridge along which is a single row of scales (in young the ridge is naked or with single scales).

Scales on blind side cycloid; on eyed side usually cycloid. The head and along the dorsal fin are covered with ctenoid scales. Lateral line slightly curved, not forming an arch. Color uniform brown without spots. Measurements of four examples follow: adult (375 mm.) and three young (136-174 mm).

Measurements of Hippoglossoides elassodon from Bering Island

Total length in mm.	375	136-174 (3 examples)
Percentage SL		
Head	33.4	28.6-30.5
Greatest depth	47.8	35.7-39.4
Percentage of Head		
Horizontal diameter of upper eye	27.6	29.7-32.6
Snout from upper eye	17.1	12.8-16.3
Pectoral length, eyed side	43.8	37.5-46.5
Preorbital width	1.8	-

Greatest number of gill rakers on first arch & etc. narrow and slightly scaled interorbital etc. show the relationship to the typical H. elassodon which is common on the American coasts from Bristol Bay to Puget Sound. Our examples differ in a larger number of gill rakers x plus 16-19 (in Jordan & Evermann, 1898, p. 2615: 14-16), however Hubbs (1915, p. 463) lists the gill rakers as 3 or 4 plus 16-19 in four examples from Puget Sound and Kamchatka.

68. Hippoglossoides robustus Gill & Townsend

This species was described on the basis of one example from the SE Bering Sea (56° 14' N, 164° 8' W, 49 fathoms). One was described later from Kamchatka as H. hamiltoni Jordan & Gilbert is placed in the synonymy of H. robustus Gill and Townsend by many authors (P. Schmidt, 1915, Soldatov & Lindberg, 1930, Norman, 1934). In our collections are specimens from the northern Bering Sea and Chukchi Sea where heretofore the genus Hippoglossoides was unknown. Our examples[1/] are from Koriak land at Cape Navarin and the Anadyr cold spot (DALNEVOSTOTCHNIK,

1/ A large number of flounders belonging to the genus Hippoglossoides were caught

1932), south of Bering Strait and in the Chukchi Sea (KRASNOARMEIETZ, 1933). The Chukchi examples are young from the following localities:

1. KRASNOARMEIETZ, Aug. 16, 1933 St. 56 (54) 69° 16' N, 171° 29' W, depth 53 meters yellow muddy clay, temp. -1.3°, beam trawl, 2 juv. K. Panin.
2. KRASNOARMEIETZ, Aug. 17, 1933 St. 58 (56) 68° 42' N, 168° 13' W, depth 52 meters clay, temp. 1.6°, beam trawl, 1 juv. K. Panin.
3. KRASNOARMEIETZ, Aug. 17, 1933 St. 61 (59) 67° 54' N, 168° 57' W, depth 57 meters muddy clay, temp. 0.8° Sigsby trawl, 1 juv. K. Panin.

D 71-76 (79) A 54-58 Gill rakers 1-3 plus 9-12 (in 7 examples)

Teeth on jaws small, even. Outer edge of lower jaw less arched than in H. elassodon Jordan & Gilbert, therefore the tubercles do not protrude as much. Interorbital wider and covered by two rows of scales which are evident in an example 164 mm in length. Scales on blind side cycloid; on eyed side ctenoid. Lateral line with a noticeable curve, forming a low arch anteriorly. It is continued forward to upper eye by a pore system. Our examples 64 to 164 mm. Below are measurements taken from four examples 100 to 164 mm. in total length. In percentage of standard length, head 26.8-30.0, greatest depth 36.9-40.0, in percentage of head, longest diameter of upper eye 24.8-28.0, snout 16.2-18.0, pectoral length 40.0-51.3.

Typical coloring of eyed side in young examples. Basic color light yellow brown, with numerous small brown spots. In addition, along dorsal and anal fin and in middle of body are large dark spots.

We include our examples in H. robustus Gill & Townsend (=H. hamiltoni Jordan & Gilbert = H. propinguus Hubbs) on the basis of the reduced fin rays and gill rakers, scaley interorbital and other characters. The young differ only in color. From H. elassodon from the Commander Ids. it differs as follows:

1. Fewer dorsal and anal rays
2. Fewer gill rakers
3. A much wider interorbital with two scale rows
4. A grester curve in the lateral line
5. Much rougher ctenoid scales
6. Much smaller eye size (in examples of equal size)
7. Much more elongate body
8. Spotty coloring of young and many other characters.

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in the region of Avachin Gulf, but unfortunately cannot be identified, as they are not available for study. H. Rendahl (1931, no. 18, p. 65) records Hippoglossoides elassodon Jordan & Gilbert from Avachin Bay. Rendahl's examples (162.5 mm) approaches the typical form through the listed characters D 86, A 64, gill rakers 5 plus 18 (eyed side), but differs in a few measurements (eye, snout, etc.).

Representatives of the genus Hippoglossoides previously have not been found north of Bering Strait and possibly in previous years were absent. But in 1933 due to a noticeable increase of the warm current through Bering Strait northward to the Chukchi Sea, the eggs and even pelagic larvae of this flatfish may have been carried there. Therefore the finding of H. robustus in the Chukchi Sea may be merely passive (with the aid of the current), thus widening its distribution. Future studies will show if this flatfish is adapted to the Chukchi Sea or whether the young will migrate back south.

69. Lepidopsetta bilineata (Ayres)

This species is common in the northern Pacific Ocean Japan Sea to Monterey on the American coast. Our material indicates that a twin lined flatfish is distributed sparcely in Bering Sea not in accumulated banks or numbers, and extending north to the southern warmer portion of the Anadyr Gulf-St. Lawrence cold shallow water.[1/] One young from Bering Island. Common at depths of 50 to 100 meters on rocky gravel, rarer on sand (never on clay), avoiding negative temperatures, range 0.4 to 2.2°.

D 74-82 A 57-61 Ll about 85 Gill rakers 4 plus 6

70. Limanda aspera (Pallas)

Very common in the northern Pacific from Peter the Great Bay in the Japan Sea to Vancouver Id. along the Pacific coast of America. Reaching Bering Strait to the north but absent from the Chukchi Sea. We found it in Avacha Bay, Anadyr Gulf and off the mouth of the Yukon and northward on the KRASNOARMEIETZ (1933) expedition to south of Bering Strait (st. 74 (65), 64° 30' N, 167° 22' W, 33 meters, sand, temp. 0.4°, Aug. 31, 1933, otter trawl, 2 examples, K. Panin.)

In the above regions no banks were found, only single numbers of spiky limanda were on sand or sandy-clay at depths of 20 to 130 meters, at temperatures of 0.2 to 1.9° (one 35 cm. example from the mouth of the Yukon was taken at a temp. of 9.5° at 20 meters)

D 66-75 A 50-61 P 12 Ll 80-89 Gill rakers 6 plus 8-9 (eyed side)

1/ On the American coast of the Bering Sea Jordan & Evermann (1898, pt. 3, p. 2643) record it to Bering Strait.

Teeth molariform or sharp, but not serrate; better developed on blind side. Ll with a high arch with some 22-25 pores. Head length in examples 131 to 165 mm. is 25.2-25.4% SL. Gill rakers short and fat not covered by spines. The color is conspicuous which consists of narrow black lines, crossing the body at the base of the unpaired fins. The lines are distinct in live examples but fade in alcohol. Unpaired fins yellow on blind side. In spring they are dark on the eyed side with light edges.

71. Limanda proboscidea Gilbert

In three years' investigations in the bering Sea, this species was found only once: DALNEVOSTOTCHNIK, Aug. 21, 1932, st. 42 (35), 62° 48' N, 168° 30' W, 60 miles NW of Cape Romanof (America) near the mouth of the Yukon, 20 meters depth on sand, bottom temperature 9.5°, otter trawl, 1 example, A. Andriashev.

The snout very long, blind side yellow, not in two yellow bars as in the related Limanda punctatissima Steindachner from the Japan Sea.

The find of this form at the mouth of the Yukon forms the northernmost record for the species.

72. Pleuronectes quadrituberculatus Pallas[1/]

Pleuronectes quadrituberculatus Pallas Zoogr. RoosoAsiat, 3, 1811, p. 423.
Platessa quadrituberculatus Schmidt, Bull Pacific Ocean Comm Akad Sci, 1933, no. 3, p. 36.
Pleuronectes pallasi Norman, 1934, l.c., p. 349, fig. 256 (Synonymy).

A flatfish having four tubercles is common throughout the entire Bering Sea. North to Providence Bay[2/], common in Anadyr Gulf, but most (commercial) banks are much further south (Avacha Bay), where an otter trawl took 300 examples of big and fat flatfish. Usually found on sandy bottoms, single examples on rocky gravel facies (Anadyr Gulf, Providence Bay, Cape Ginther and Cape Navarin). Bathymetric range wide (20 to 150 meters) but unusual quantities of four tubercled flatfish were found in early June (DALNEVOSTOTCHNIK, st. 1 off Cape Piramidnogo, south of Avachin Bay) at depths of 100 meters (300 examples), in the same region their numbers diminished (to about 40 examples) at greater depths (150 meters).

1/ The so-called four tubercled flatfish usually has 5 tubercles on the preorbital. Single examples have been found with 6 and 7 tubercles.

2/ On the American coast to Bering Strait.

Temperature range wide, both above and below zero (-0.8 to 4.5°) young taken in late August off the Yukon Mouth were taken at depths of 20 meters and a temp. of 9.5°. The wide range of temperature and depth in which P. quadrituberculatus is found can be due to the migration to coastal spawning ground, the different habits employed for spawning, feeding and in wintering. Feeding is varied, in a trawl haul off Cape Piramidnogo (depth 96 meters, temp. -0.2°, on clay and sand with some gravel) ripe individuals of this species were taken (males in IV-V year class, females in IV year class) whose stomachs were full, having large numbers of polycheats (Families Polynoidae, Terrebillidae and Nephthys) Actinnia (to 10 examples in one stomach), Gammaridae, and much rarer, mollusks (Macoma).

Measurements of 69 examples (st. 1 off Cape Piramidnogo) indicate the following:

P. quadrituberculatus from Avachin Bay

Total length, cm.	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	No. of examples
Males	1	2	-	2	2	6	9	3	2	4	2	-	-	-	-	-	-	-	1	34
Females	-	-	-	-	1	3	1	3	-	4	4	3	3	1	3	4	3	1	1	35
Total	1	2	-	2	3	9	10	6	2	8	6	3	3	1	3	4	3	1	1	69

Average length of males	42.21 cm
Average length of females	47.11 cm
Average length of sexes combined	44.69 cm

During the KRASNOARMEIETZ expedition (1933) ichthyologist K. I. Panin measured 66 examples of four tubercled flatfish from Anadyr Gulf with the results ranging from 21 to 60 cm., average 34.5 cm.

In southern areas this species may be a good resource for the commercial trawl fishery. According to I. A. Polutov, the species occurs in Litke straits and Olutorsky Gulf and along Koriak Land and in Anadyr Gulf but not in large banks.

73. Platichthys stellatus (Pallas)

Very common on both coasts of Bering Sea, Commander Ids., north to Chukchi Sea (Kotzebue Sound) but absent in the arctic. It is replaced in the Atlantic by the related P. flesus L. Prefers shallow waters, often occuring in brackish conditions. In the spring approaches in great numbers coasts and river mouths. We found it in Avacha Bay and along the coast of Koriak Land.

74. Clioderma asperrimum (Schlegel)

This form, armed with bony tubercles, is known from the Sea of Japan and east Sakahlin. The 1931 TIRH expedition found it along western Kamchatka and then at the Commander Ids. (KRASNOARMEIETZ, 1932, st. 5 and 6). The example I examined from the Commander Ids. does not vary from previous descriptions.

75. Glyptocephalus (Errex) zachirus Lockington

Frequently found in the eastern part of the Bering Sea (at Unimak, Priblov Id. and north to 58° N). Absent in the western Bering Sea and Commander Ids.

Family Trichodontidae

76. Trichodon trichodon (Tilesius)

A single example in our collection obtained by E. Kardakova (1931) from the littoral of Medni Id.

D XIV, 20 A 31 P 23 V I, 6 Male

Last ray of first dorsal same length as previous ones, not longer as indicated by Jordan & Evermann (1900, pt. 4, fig. 806).

Anal papillae of male flat and thin, beside it is a triangular flap.

Family Bathymasteridae

77. Bathymaster signatus Cope

In our waters known only from the Bering Sea, along the Asiatic coast from Petropalvsk north to Cape Olytorsky (DALNEVOSTOTCHNIK 1932); Commander and Priblov Ids. south to Sitka on American coast. Absent in Okhotsk Sea.

Our examples from Cape Olytorsky (depth 142 meters on fine and coarse gravel with sand; 3 examples 92-142 mm TL) and Commander Ids. (PALTUS, 1932 st. 6, 1 example 310 mm).

D 46-47 A 34-35 P 21 Ll 100 Gill rakers 6-7 plus 16-17.

78. Bathymaster caeruleofasciatus (Gilbert & Burke)

Only one example about 160 mm. long taken by E. Kardakova from Medni Id., from the gullet of a treski (cod) which was caught at 100 meters depth. Gill rakers few (4 plus 10) from which it differs from B. signatus Cope. Gilbert & Burke record this species from Agattu, Petrel Bank, Medni Id. and Bering Id. A. Y. Taranetz lists it from the Okhotsk Sea.

Family Blenniidae

79. Bryostemma polyactocephalum (Pallas)

The KRASNOARMEIETZ (1933) expedition obtained two brightly colored examples from St. 99 (85) off Cape Olytorsky, depth 32 meters, rock, temperature 3.2°. Both examples males with mature gonads (Sept. 9, 1933).

D LIX, A I, 44-47 P 15

Numerous branched fleshy cirri on top of head, snout and on ends of first 3-4 dorsal rays, and on edge of preoperculum and lower jaw. A pair of double cirri on gill membranes and each Ll. pore. Vomer rough but without teeth, as is palatine. Gill rakers short, not hill-like (according to Jordan & Evermann, 1898, 3, p. 2408 "gillrakers not developed"). Teeth on jaws in one row, small, serrated, forming an entire cutting edge. Upper jaw extending to vertical from middle of eye. Pectoral broad, its length equals the head, its length seven times in the body. Body covered with fine scales, Head naked as are dorsal and anal fins, only their bases have small scales. Body light, pinkish brown with 11 dark purple bars that end in spots on dorsal. On sides bars fuse and become pale. Anal fin pale pink with 11 dark opaque spots. Caudal rays bright red. Our examples 136 and 150 mm.

80. Bryolophus[1/] lysimus Jordan & Snyder

Bryostemma polyactocephalum Jordan & Starks (non Pallas). Proc Calif Acad Sci 1895, p. 841 (in part). Jordan & Evermann, 1898, l.c., p. 2408 (in part).
Bryolophus lysimus Jordan & Snyder Proc US Nat Mus. 24, 1902, p. 617, fig. 3 (Unalaska Id).

Among our material is one example which corresponds in all characters to Bryolophus lysimus Jordan & Snyder but varies by the presence of small teeth on the vomer and palatines and has short gill rakers (Jordan & Snyder state "gill rakers very long and pointed"). It is quite possible the small teeth on the vomer and palatine may have been overlooked by the authors (type No. 50571 US Nat. Mus. 100 mm. long). It is difficult to judge the size of the gill rakers as the authors do not compare their measurement of this structure with anything. If the type of B. lysimus really does not have teeth on the vomer and palatine then our example (and others from the Okhotsk Sea) belong to a new genus and species.

Our example was taken from the mouth of a black paltus by K. I. Panin which was caught NW of St. Matthew Id.

D LXV A 48 P 15.

1/ Whitley (Austr. Zool., vol. 6, p. 334) gives a new name to this genus on the basis of priority: Bryozoichthys (this work unavailable to me).

Teeth on jaws are small, conical and sharp. Placed in a narrow band not forming a complete or entire cutting edge (as in Bryostemma). Small sharp teeth on vomer and palatine. About 15 gill rakers whose length is less than in examples of B. polyactocephalum of the same size. Between inner and outer rows of gill rakers is a sharp ridge. Cirrus on head weaker developed than in B. polyactocephalum. One unpaired cirrus on snout. Two pair between eyes. Anterior one higher, with fringes, posterior one lower and branched. Nape and occiput covered with thickly branched cirri. This form of cirri also on 1-3 dorsal ray. A pair of cirri on chin. Two or three on upper part of gill cover. Cirri absent from gill membrane and side of head.

Body covered with small scales reaching behind pectoral. Head naked. LL reduced to 5-6 pores, not reaching to vertical from anterior half of pectoral fin. Dorsal and anal connected to caudal by a membrane. Anal origin under 15th dorsal ray. Color poorly preserved, but in general not different from that described by Jordan and Snyder. Dark ocelli on the 4th and 7th dorsal rays are clearly evident. On the edge of the gill membrane is a thin dark line. Female with mature large eggs diameter 1.4 mm (average of 10). Some of the measurements follow:

In percentage of total length, Head 13.2, depth at anal base 12.5, pectoral length 11.8. In percentage of head, eye 30.0, snout 17.5, ventral fin 30.0, longest dorsal spine 35.0.

B. lysimus was heretofore known from three examples from Unalaska. Our example from St. Matthew Id. According to A. Y. Taranetz, it occurs in the Okhotsk Sea (56° 11' 7 N, 143° 19' E, depth 165 meters) as a separate subspecies.

81. Alectrias alectrolophus (Pallas)

This littoral species is very common in the Asiatic north Pacific, Japan and Okhotsk Seas, and on the coasts of East Kamchatka and the Commander Id. It is known from St. Michael where Bean (Proc. USNM, 4, 1882, p. 245) records it as Anoplarchus atropurpureus (Kittlitz). On the Aleutian and American coast south, it is replaced by Anoplarchus cristagali (Gunther) and subspecies. Our examples were taken in May and June from the littoral of Bering Id. & Medni Id. by E. Kardakova.

D LXII A 43

Gill membranes connect to each other at an angle, and weakly connect to the isthmus forming a broad fold. Ll is hardly noticeable, consisting of a row of pores visible only under enlargement. Dorsal to middle Ll is another rudimentary line of microscopic pores.

82. Stichaeus punctatus (Fabricus)

Amphiboreal, common in the Atlantic only on American coast (Greenland, Hudson Bay and South of Newfoundland), in Chukchi Sea (Nothogrammus (SIC) rothrocki Bean) and Bering Sea south to Bristol Bay and Kodiak Id.. In the Okhotsk Sea replaced by a subspecies S. punctatus pulcherrimus Taranetz, in the Japan Sea by two species S. nazawas Jordan and Snyder and S. ochriamkini Taranetz. In northern European seas S. punctatus is absent along with several other common amphiboreal types: Hemitripterus americanus, Aspidophoroides monopterygius, Pholis fasciatus, Eumesogrammus praecisus, Microgadus proximus, etc.

Our example from Providence Bay (Emma Bay) in 20-30 meters. Total length 127 mm

D L, A II, 36 P 15

83. Eumesogrammus praecisus (Kroyer)

Clinus praecisus Kroyer Ichthy. Bidrag., Nzt. Tidsk. I, 1837, p. 25 (Greenland).
Clinus unimaculatus Reinhardt, Dansk Vidensk Nat. Math Afh. 1838, p. 21 (Greenland).
Ernogrammus storoshi Schmidt, Fish east. seas, 1904, p. 193 (East Sakahlin).
Eumesogrammus praecisus Schmidt & Andriashev, Copeia, 1935, p. 27, fig. 1-2 (Synony.).

This species was first recorded in the northern Pacific by P. Y. Schmidt (1904 as Ernogrammus storoshi sp. nov.) followed by numerous finds in Okhotsk Sea and Bering Sea.[1/] A detailed comparison of our examples with the 100 year old Greenland examples of Clinus praecisus Kroyer (=Clinus unimaculatus Reinhardt) shows them to be conspecific. Thus it appears that the species commonly occurs amphiboreally, on one side in the Okhotsk and Bering Seas and on the other in Greenland and Hudson Bay (V. Vladykov, 1933, p. 23). In our collections are 79 examples from the northern part of Bering Sea (from Cape Olytorsky to Bering Straits, inclusive) from depths of 40 to 70 meters (rarely to 142 meters) usually on rocky gravel bottoms at temperatures above zero. (See table in P. Schmidt & A. Andriashev, 1935, l.c., p. 60).

Eumesogrammus praecisus differs from all other types of Blenniids by having the last 2-3 elements of the anal fin spinous.

1/ Unknown in the eastern part of Bering Sea.

84. Lumpenus medius (Reinhardt)

This species is circumpolar, extending south on the asiatic coast to the Sea of Japan. Common in the northern Bering Sea and Chukchi Sea at depths of 30 to 98 meters. Found primarily on clay and muddy clay, rarely on sandy clay, at temperatures usually considerably below zero. (see table).

Table of water temperatures at stations where Lumpenus medius has been obtained in the Bering and Chukchi Seas.

Temperature	-1.7 to -1.5	-1.5 to -1.0	-1.0 to -0.5	-0.5 to 0.0	0.0 to 0.5	0.5 to 1.0	1.0 to 1.5	Total
Number of Specimens	85	135	1	3	6	3	2	235
Number of Stations	4	4	1	1	2	1	1	14

The form is characteristic of the Anadyr cold spot as a component of the arctic biocenosis, together with Ophiura sarsi, Macoma calcarea and Lycodes palearis arcticus Taranetz and Andriashev. Our examples from Imatra Bay (Koriak Land), Anadyr Gulf and the Chukchi Sea extending to Herald Island.

85. Lumpenus fabricii (Cuvier & Valenciennes).

This species is amphiboreal; absent in seas washing the northern coasts of Asia (Kara, Laptev and East Siberian). In far eastern waters, distributed from Chukchi Sea to Sea of Japan avoiding cold waters, unlike L. medius (Reinhardt). Our examples from the warm part of S. E. Chukchi Sea at depths of 49-57 meters, clay bottom, temperatures 0.4 to 1.6°.

86. Leptoclinus maculatus diaphanocarus (Schmidt)

Leptoclinus maculatus Jordan & Evermann, Fish N. Amer. 3, 1898, p. 2433 (in part, Pacific Ocean).
Plectobranchus diaphanocarus Schmidt, Fish. east seas, 1904, p. 182, (East Sakahlin juvenile).

There are two examples of Leptoclinus maculatus from the KRASNOARMEIETZ (1933) expedition taken in Anadyr Gulf.

1. Bering Sea. Anadyr Gulf. St. 16, 63° 16' N, 173° 16' W, 78 meters, rocky gravel. Bottom temp. 1.3°, beam trawl, July 30, 1933. One ex. K. Panin.
2. Bering Sea. Anadyr Gulf. St. 23, 63° 50' N, 173° 00' W, 63 meters, gravel, bottom temp. -0.8°, dredge. August 2, 1933, one juvenile. K. Panin.

In addition there are examples in the collection of the zoological institute of the Akad. Nauk SSSR from the Okhotsk Sea (No. 18057 and 20338). A comparison of this material with Leptoclinus maculatus (Fries) from the north Atlantic Ocean (No. 3349, 11889, 11890, 12795 and 20385 Zool. Inst. Aka. Nauk, SSSR) indicates that they differ in the number of rays in the unpaired fins:

		Dorsal	Anal
Bering and Okhotsk Sea	(5 ex)	LXI-LXIV	I, 37-39
North Atlantic Ocean	(5 ex)	LVII-LXI	I, (II) 34-37

N. M. Knipovich[1/] records the following counts from Barents Sea examples: D LVIII-LXI, A. I, 34-37 (after Tilemann D LVIII-LXI, A 32-38, i.e. I, 31-37). In addition, not a single Pacific Ocean example had large canine teeth on the jaws, whereas L. maculatus (Fries) (no. 11889 and 20385 ZIN Akad Nauk SSSR) usually possess them.

These differences (and measurements) allow one to consider the Pacific Ocean representatives as a separate geographical subspecies. However, A. Y. Taranetz kindly informed me that the species described as new by P. Y. Schmidt (1904, p. 182) as Plectobranchus diaphanocarus from East Sakahlin was erroneously placed as to genus but is very close to Leptoclinus maculatus (Fries).

Comparison of our examples with Plectobranchus diaphanocarus Schmidt (Type no. 12959 and 12960 ZIN Ak. Nauk SSSR) showed that:

1. Plectobranchus diaphanocarus Schmidt is far removed from the genus Plectobranchus Gilbert (evides) in which the "gill slit is not continued far forward, the membranes broadly united, wholly free from the isthmus" (Jordan & Evermann, l.c., p. 2431-32.).

2. Plectobranchus diaphanocarus Schmidt does not differ from Leptoclinus maculatus from the Okhotsk and Bering Seas and possesses, as other related forms of the genus Lumpenus, anterior extending gill slits.

3. The aforementioned examples must be called Leptoclinus maculatus diaphanocarus (Schmidt) which differ from L. maculatus (Fries) of the North Atlantic Ocean in a larger number of rays in the dorsal and anal fins, a longer pectoral and a less elongated lower jaw; also by the absence of canine teeth in the front of the upper and lower jaws.

1/ N. M. Knipovich. Identification of fish from Barents, White and Kara Seas. Trudy Inst. North. Studies, 1926, vol. 27, p. 99.

Family Ptilichthyidae

87. Ptilichthys goodei Bean

First found on our coasts of the Bering Sea by A. Y. Taranetz (1933) in a cod stomach taken from Litke Bay at 40 meters depth on a clay bottom.

Total length 300 mm. Head 4.7% of TL, depth of body 1.9% TL, eye 14.1% of head. Barbel of lower jaw a little less than diameter of eye, 11.8% of head. A second example of this rare species was taken by K. I. Panin at the mouth of Avachin Bay (1935).

Family Zoarcidae (sensu lato)

88. Lycodes palearis palearis Gilbert

Lycodes palearis Gilbert Rept US Fish Comm, 1895, p. 454 (Bristol Bay, 36-46 fath.).
Lycodes digitatus Gill & Townsend Proc. Biol. Soc. Wash., vol. 61, 1897, p. 232 (Bristol Bay, 49 fath.).

Lycodes palearis includes a large group of forms inhabiting all North Pacific seas. The study of our rich material for eastern seas of the genus Lycodes indicated that this group is represented by four closely related forms, classified as subspecies:

1. Lycodes palearis palearis Gilbert (=L. digitatus Gill & Townsend) east Bering Sea south to Oregon.
2. Lycodes palearis arcticus Taranetz and Andriashev subsp. nov. Anadyr Gulf north to Chukchi Sea.
3. Lycodes palearis brashnikovi Soldatov Okhotsk Sea (and probably even SE Kamchatka).
4. Lycodes palearis fasciatus (Schmidt) (=Lycenchelys fasciatus Schmidt, 1904) North Japan Sea and Aniva Bay.

The examples of Gilbert's typical subspecies were from Bristol Bay. The KRASNOARMEIETZ expedition (1932) collected them at a number of stations also in the eastern part of the Bering Sea from the Priblov Ids. almost to Cape Navarin where this form approaches the common L. palearis arcticus Taranetz and Andriashev of the North.

Our examples are from 300 to 457 mm long and do not differ from Gilbert's or Gill & Townsend's (1897, p. 232) description. The latter authors describe from this same region (55° 14' N, 164° 08' W, 49 fath) a new species L. digitatus that differs from L. palearis Gilbert by the presence of four bars along the body and shorter pectoral fins. However, we have examples that in all details are similar to L. palearis from the eastern Bering Sea but have lateral reddish bars along the body that appeared upon preservation. This is noticed in other types also (L. brevipes). The shorter pectoral fins we must attribute to the larger size of their single example (about 45 cm). The above data bear out Jordan & Evermann (l.c., 1898, pt. 3, p. 2466) contention that Lycodes digitatus Gill & Townsend is the adult of L. palearis Gilbert.

Below follows a short description of our material.

D 102-106 A 88 P 17 Gill rakers $\frac{\text{2 plus 10 (outside row)}}{\text{0 plus 11 (inside row)}}$

Head 17.8-19.9% of TL, eye small 16.0-17.5%, snout measured from front part of eye 28.0-32.6% of head, bony interorbital 0.8-1.0% TL, 4.4-5.5% of head.

Mandibular flaps separate, compressed, not joined. The thin and high front lobes are pointed anteriorad. Lower lip with a well developed free flap. Upper jaw projecting. Posterior end extends to a vertical from middle or posterior of eye. Teeth on upper jaw main row 12-14, the anteriormost the largest. Inner row 2-3 teeth on each side placed on widened portion of premaxillary. Lower jaw teeth blunt, conical, smaller anteriorly, forming a plate of disorderly arranged small teeth. Palatine with 8-11 large sharp teeth. Teeth on vomer blunt and conical. Gill rakers on first arch have 2-3 elements on inside and smooth or with one element on outside.

The body considerably elongate, depth at base of anal fin 8.2-9.3% of length, predorsal 22.2-25.4%, preanal 42.9-44.4%. Scales well developed, small, covering body from nape to vertical from dorsal origin, on abdomen to base of ventral fin. Ll is ventrolateral[1/] (in all subspecies), quite indistinct. Extending from upper edge of gill opening, arching down and back near the end of pectoral (or even before) and disappears. It then appears on middle of body at vertical from anal origin and extends to tail. This form of lateral line is typical to many species but not all its parts are visible in all forms. Therefore, it is possible that the mediolateral portion of the LL was not noticed by Gilbert when stated in the description of L. palearis "Lateral line short, decurved, extending scarcely beyond middle of pectorals".

1/ That is, the anterior part arches downward on abdomen but at the vertical from the anus, rises and continues along the middle of the side of the body to the tail. Usually the rising portion is indistinct and has a small break or is absent entirely, giving rise to what most authors describe as two lateral lines.

The pectoral short, usually not extending halfway to origin of anal; some 11-13% of the length. Ventral relatively long, 2.2-2.6% length, 11.0-14.0% of head.

Color of our examples poorly preserved, the narrow vertical light bars have almost disappeared.

Reaching a large size (to 1/2 meter), mature examples not less than 300 mm long.

89. Lycodes palearis arcticus Taranetz and Andriashev, subsp. nov. (plate 1, figs. 9-10).

This small cold water form we consider a subspecies of the typical L. palearis, differing from it primarily as follows:

1. Smaller size of body, (maturing at 140 mm), a female 250 mm long was ripe. 2. Large pectoral fins, a larger eye diameter, longer head and other measurements (see description). 3. A much sharper mandibular flap. 4. Coloring.

Examples belonging to this subspecies were found at many stations in Anadyr Gulf and two examples were taken in the Chukchi Sea. This form occurs as one of the characteristic components of the cold Anadyr biocenosis on clay bottoms together with Ophiura sarsi and Lumpenus medius, comprising the major mass of the trawl catches. In Anadyr Gulf it was found at depths of 84 to 110 meters, usually at very low bottom temperatures (0.9° to -1.7°).

D 98-104 A 84-88 P 17 Gill rakers $\frac{3 \text{ plus } 12}{0 \text{ plus } 11}$

Head longer than in typical form, 20.3-21.0% of length, eye large 19.0-21.9%, head length (16.0-17.5 in typical form), snout considerably elongated and sharp 28.9-34.5% of head. Interorbital narrow, 0.6-1.0% length, 3.0-4.6% head. Mandibular flaps separate, thin, high, particularly anteriorly where they form an anteriorad protruding sharp lobe (plate 1, figs 9-10). Jaw extending to vertical from middle of eye. Distribution of teeth on jaws, vomer and palatine as in L. palearis palearis Gilbert. Depth at base of anal fin 7.8-9.1% length, predorsal 24.4-27.6% length, preanal 41.2-43.3% length. Lateral line indistinct, ventrolateral, but posterior portion on mediolateral section of body not always detectable, particularly in young.

Pectoral longer than in other subspecies, reaching half to two thirds the distance to anal origin, 67-80% of head, 13.0-15.6% of length. About five lower rays with free tips. Ventral comparatively long 2.7-3.1% of length, 13.4-15.5% of head.

Coloring of body pale, grayish green or yellowish. Indistinct light bars across body and dorsal fin. More evident in young examples, almost absent in examples 200 mm long. Back along dorsal and top of head darker. At dorsal usually two light lines, the first connecting the tops of the gill opening . Ventral fin completely light. Anterior portion of dorsal with a black ocellus, distinct in young. Fins are light, not bordered with a darker color.

Length of our examples from 90 to 250 mm, examples described of six (mature) examples 143-250 mm. L. palearis arcticus Taranetz & Andriashev is much closer to the typical L. palearis of the Bering Sea and probably represents a small light colored arctic worm connected by intergrades with the typical form. The above differences and proportions of body indicate juvenile characteristics (large head, eye, pectoral, etc.) but are present in mature examples. Here is an example of subspecies formation through neoteny, that is, the ability to reproduce at earlier stages than is usually possible.

90. Lycodes brevipes diapteroides Taranetz & Andriashev forma nov.
(plate I, figs. II-12)

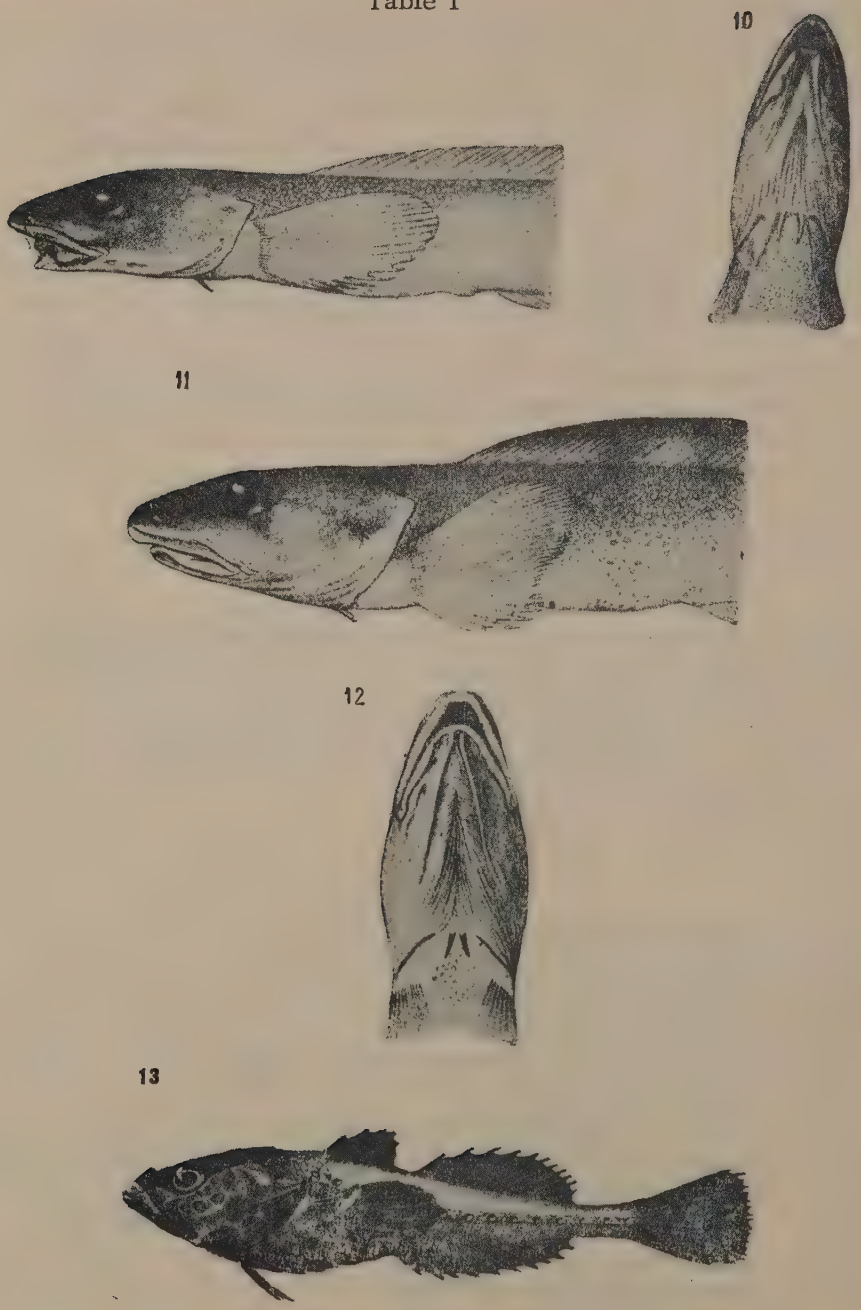
A large number of lycoids related to Lycodes brevipes Bean were found in the eastern Bering Sea (KRASNOARMEIETZ, 1932) and SE of Cape Navarin (KRASNOARMEIETZ, 1933) These examples differ from the typical form which is common from the Aleutians south to Puget Sound in a larger number of D & A rays, a weaker developed L1, presence of an indistinct lower lobe in the pectoral and other characters, are identified by us as a separate form diapteroides.

Localities:

1. Bering Sea. KRASNOARMEIETZ, Aug. 28, 1932, Otter trawl 71 meters (off Priblov Id.) 1 ex. M. Vernidub.
2. Bering Sea. KRASNOARMEIETZ, Sept. 7, 1932, otter trawl 92 meters (off Matthew Id.) 1 ex. M. Vernidub.
3. Bering Sea. KRASNOARMEIETZ, Sept. 8, 1932, otter trawl 96 meters (north of St. Matthew Id.) 3 ex. M. Vernidub.
4. Bering Sea. KRASNOARMEIETZ, July 26, 1933, St. 2, 62° 08' N, 178° 15' W (SE of Cape Navarin (98 meters, temp. -0.1° grayish green muddy clay, beam trawl), 4 ex. K Panin.
5. Bering Sea. KRASNOARMEIETZ, July 26, 1933, St. 3, 61° 48' N, 177° 15' W (SE of Cape Navarin) 110 meters, muddy clay, temp. 0.9°, otter trawl, 2 ex. K Panin.

D 99-101 A 83-85 P 19-20 (in 3 ex) Gill rakers $\frac{2\text{-}3 \text{ plus } 11}{0 \text{ plus } 11\text{-}12}$

Table 1



Figs. 9 and 10: Lycodes palearis arcticus Tar. & Andr., subsp. nov. southern part of Anadyr Gulf.

Figs. 10 and 11: Lycodes brevipes diapteroides Tar. & Andr., forma nov. southern part of Anadyr Gulf.

Fig. 13: Zesticelus profundorum (Gilb.). Anadyr Gulf

Head 17.4-19.8% of TL, eye large 22.8-24.3% of head, smaller than snout, which is 28.1-30.9% of head.

Interorbital very narrow 0.6-0.8 TL, 3.5-4.7% of head. Upper profile of head noticeably slanted from interorbital to snout, which is pointed. Mandibular flaps thin and low, in front diagonally cut not producing lobes. Free flap of lower lip weakly developed not forming a sharp ridge between adnate portion, which is considerably shorter than length of free part of lip. Upper jaw short, reaching to vertical from middle of eye, projecting considerably over lower jaw. The lower jaw has sensory pits (but not pores).

Teeth on upper jaw in three rows. Outer with 10-12 teeth, the 2-3 anteriormost are larger, middle row with 8-11 teeth, slightly lower than outer row. Inner row with 3-4 teeth. On posterior of lower jaw a single row of teeth usually small and blunt, forming a plate. 13-14 teeth on palatine in a single row, vomer with 3-4 teeth.

Gill rakers on inner side with 1-2 elements, outerside naked.

Depth at anal base 7.7-9.4% TL, predorsal small, 24.0-25.8% anterior part of body short, preanal distance 40.5-42.3% of length.

Scales well developed, large (a 200 mm ex., about 7-9 scales in 10 mm. section behind pectoral fin), covering entire body, reaching dorsally almost to gill openings, laterally not quite extending to base of pectorals. Anterior to dorsal base is a row of small scales. Abdomen covered with scales to base of ventrals, scales extend to base of unpaired fins anteriorly, covering more than 3/4 their height posteriorly.

Lateral line indistinct, beginning at upper part of gill openings, extending down and back, disappearing under pectoral fin, not reaching anus (in typical form extends to above 11th anal ray). Mediolateral section without pores as in typical form.[1/]

Dorsal and anal fins high. Form of pectoral characteristic; lower six rays with free tips and elongated in comparison with middle rays, forming a weak lower lobe; as such approaching the Furcimanus group, which possess a completely differentiated lower pectoral lobe. Pectoral length 11.3-13.4% L, 57.7-70.2% head. Ventral very short, just slightly more than 1/3 eye, 1.3-1.9% L, 6.7-10.2% head.

1/ L. brevipes from Okhotsk Sea (P. Y. Schmidt, Fish Okhotsk Sea, 1935 MS) has the LL ventrolateral, or in other words, descends in an arch over abdomen and continues on posterior half of body in a mediolateral position.

Color of body grayish, lighter below. 13 narrow light bars across body, continuing diagonally on dorsal fin. In alcohol the lines fade and disappear, being generally faint in adults. Top of gill openings connected with light lines. All fins light, dorsal and anal bordered by a black line which widens posteriorly.

Pyloric caeca 2, both tubercle shaped. Diameter of eggs 3.3 mm (average of 10 eggs). Our examples 149-232 mm. in length.

L. brevipes has been known only along the American coast from Bristol Bay and the Aleutians south to Puget Sound. Recent data indicate their distribution is wider; north of Bering Sea it is replaced by a closely related form[1/] and also represented by a distinct form in the Okhotsk Sea.

91. Lycodes soldatovi Taranetz & Andriashev

Lycodes soldatovi Taranetz & Andriashev, Zool. Anz. 1935, Bd. 113, Heft 9/10, p. 246, fig. 3.

The archibenthal species of Okhotsk Sea. In the ichthyological laboratory of LGU (Leningrad State University) is a single example which cannot be distinguished from the Okhotsk form from Olytorski Gulf (PALTUS, 1932 M. Vernidub). However our identification is not certain. See details in original description.

92. Lycodes raridens Taranetz and Andriashev Sp. nov.

Lycodes sp. Schmidt Fish east seas, 1904, p. 199 (East Sakahlin, Cape Rimnik).
Lycodes schmidti Soldatov Ann Mus Zool. Acad Sci Petrab. vol. 22, 1917, p. 115, fig. 2 (in part, after Schmidt's specimen).
Lycodes knipowitschi Popov Explo. Seas SSSR, GGI, vol. 14, 1931, pp. 139-140 (in part, "varitie or juveniles").

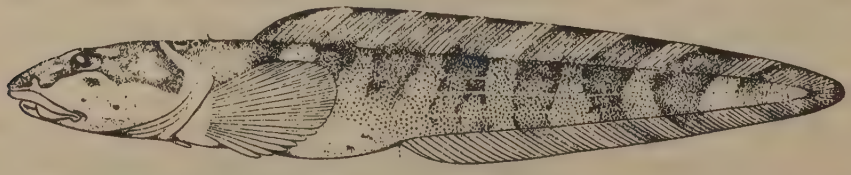


Fig. 14. Lycodes raridens Taranetz & Andriashev, sp. nov. Type. Southern part of Anadyr Gulf.

1/ The inability to compare our material with the types of L. brevipes Bean coupled with Bean's short description does not permit us to insist on the differences of our form, it probably will be classified as a subspecies.

This new species was found in large numbers by the TIRH and GGI expeditions in 1931-33 in the Okhotsk, Bering and Chukchi Seas. To this form undoubtedly belong some previously reported examples, namely; Lycodes sp. (P. Y. Shmidt, 1904 p. 199, off Cape Rimnik, 1899) erroneously identified as L. schmidti by V. K. Soldatov, and A. M. Popov's material (1931, pp. 139-140) recorded as "L. knipowitschi varieties and juveniles".1/

Fig. 15, Lycodes raridens Taranetz & Andriashev.

Localities:

1. Chukchi Sea. DALNEVOSTOTCHNIK expedition, Aug. 17, 1932. St. 35 (29), 25 miles SE of Cape Tompson, 53 meters, sandy clay, small gravel and calcareus ooze, bottom Temp. 4.9°, 1 ex. A. Andriashev.
2. Chukchi Sea. DALNEVOSTOTCHNIK expedition, Aug. 17, 1932. St. 32 (26), 66° 45.5' N, 169° 35.5' W (24 miles SE of Cape Unimark), 47 meters, clay mixed with sand, bottom temp. 0.4°, 2 ex. A. Andriashev.
3. Bering Sea. DALNEVOSTOTCHNIK, Aug. 3, 1932, St. 21 (15), 65° 08' N, 171° 04' W (off Mechigmensky Bay), 42 meters, sandy clay, bottom temp. 0.6°, 1 ex. A. Andriashev.
4. Bering Sea, KRASNOARMEIETZ, July 27, 1933, St. 6, 61° 52' N, 173° 11' W (NW of St. Matthew Id), 66 meters, clay, bottom temp. 1.5°, 2 ex. K. Panin (Type).
5. Okhotsk Sea, GGI and TIRH expedition on trawler GAGARA, June 4, 1932, St. 210, 49° 00' N, 144° 40' E (East of Cape Terpeniy), 74 meters, clay & sand, 1 ex. S.G. Generozova.
6. Okhotsk Sea TIRH expedition on trawler PLASTUN, Aug. 13, 1932, Western Kamchatka, trawl 142, 130 meters, I. Polutov.
7. Okhotsk and Bering Sea (definite locality unknown). 5 ex.

D 83-93 A 72-76 P 18-19 Gill rakers $\frac{3 \text{ plus } 10\text{-}12}{0 \text{ plus } 13\text{-}14}$

Head 19.5-24.1% TL, eye small 14.6-19.3% head, twice in snout, snout 27.0-31.7% head. Interorbital wide (1.6) 1.7-1.9% L, 7.4-8.3% head. Mandibular flaps free, not high anteriorly with rounded edges. Lower lip adnate anteriorly; forming a wide lobe posteriorly. Distance between free portions of lower lip is equal or less than its free portion (measurement of gape?).

1/ No. 23757 Zool. Inst. Acad. Sci. SSSR, as examined by us.

Sensory pits on upper and lower jaws, in young (40-50 mm) well developed and have a similarity to the nasal sensory pore of the deep water genus Lycenchelys.

Teeth on jaws very characteristic, few, widely spaced. Posterior portion of lower jaw with 3-4 large teeth in a single row, separated; anterior portion with smaller teeth in two rows. Upper jaw with 6-9 small teeth in a single row. Occasionally 1-2 additional teeth on inner edge. Palatine with 6-8 teeth in a single row; vomer with 2-4 teeth.

Gill rakers with elements weakly developed or absent on inner side; absent on outer side.

Body somewhat elongated, depth at base of anal 8.8-10.8% L, predorsal 24.8-28.7% L, preanal 45.6-48.0 (52)% L.

Scales small, completely covering posterior part of body. Anteriorly reaching to middle of pectoral, but in large examples almost to pectoral base. In front of dorsal on back of young examples scales are absent, or sometimes represented by a narrow line of very small scales. In large examples scales may extend to line between gill openings. On the abdomen of Bering and Chukchi Sea examples (types & others) the scales are absent. In Okhotsk Sea material they are usually present (particularly in larger examples). Scales on vertical fins present, sometimes reaching to the edge in the posterior portion; in some instances less developed on fins.

Lateral line single, a simple one, extending mediolaterally to tail. In large examples visible only anteriorly and from origin of anal to tail. Pectoral 13.0-14.7% L. Ventral fins inserted a little anterior to connection of lower edges of gill cover, length 2.4-3.0% L, 11.4-12.9% (14.5%) of head.

Head in young, dark, a light spot behind eyes. The number of spots increases with age, merging to form a network of light reticulations in large adults. Lower edge of dark color on head is clearly visible, usually under eye and descending on cheek and gill openings to snout. A dark spot under eye which is separate from remaining dark area by a light upward curved line. Gill covers connected with a distinct light bar, semicircular shaped, curved portion to the front. Upper part of body with about 7 dark spots that extend to dorsal fin in the form of wide bars and end on the edge of that fin in a darker color, creating the impression of an interrupted dark line bordering the dorsal fin. Posteriorly the body marbled with dark spots which extend to anal. In adults the pattern is still further complicated, forming reticulations dorsally. Abdomen and lower surface of head yellowish white. Sometimes anal and abdomen are darker. Pyloric caeca 2, as is typical for the genus Lycodes. Our examples 100 to 700 mm long.

This species is well represented in our material from the Okhotsk, Bering and Chukchi Seas, differing greatly from previously described forms. Nearest to Lycodes knipowitschi Popov (in the mandibular flap, lips, etc.), but differs from it in the well developed scales, characteristic coloring, measurements, etc. Common in far eastern seas, usually on clay bottoms, to 130 meters.

93. Lycodes knipowitschi Popov

Lycodes knipowitschi Popov, 1931, l.c., p. 138 & 152, fig. 1, pl. 2, fig 4 (Okhotsk Sea, 40 meters).

This species, recently described by Popov on the basis of a single young example, [1] from the Okhotsk Sea, was taken by the DALNEVOSTOTCHNIK expedition in 1932 in the Bering and Chukchi Seas.

1. Chukchi Sea, st. 32 (26), 66° 45.5' N, 169° 35.5' W (24 miles NE of Cape Unimark). 47 meters, clay mixed with sand, bottom temp. 0.4°, Aug. 17, 1932, 1 ex. A. Andriashev.
2. Anadyr Gulf, St. 52 (45), 64° 21' N, 178° 45' W, 66 meters, small coarse gravel covered by clay, Aug. 29, 1932, 2 ex. A. Andriashev.

Head 23.4-22.6% TL, eye small, 13.2-18.9% head, snout 30.7-32.1% head. Bony interorbital very broad, 1.3-1.7% L, 6.7-7.6% head. Mandibular flaps free, fleshy, low, their anterior lobes rounded. Lower lip with a wide flap posteriorly, anteriorly broadly adnate. Upper lip slightly widened anteriorly. Upper jaw noticeably projecting, so its teeth are visible. Posterior end of upper jaw reaching to vertical from posterior end of eye. Teeth on lower jaw (in Chukchi Sea example) unequal in length. Main row of 9-10 teeth, outside row shorter (3-4 teeth); the several rowed tooth plate in the anterior portion of jaw is absent. On upper jaw thin, blunt teeth in a single row (9 teeth) which increase in size anteriorly. Inner row not developed, their being but a single tooth on each side anteriorly. Vomer and palatine with strong, conical teeth. Gill rakers 3 plus 1 / 0 plus 13; rakers of inner row each with 2-3 elements, outer row ending in a single element.

Body slightly elongated, depth at base of anal 9.1-12.0% L, predorsal 26.6-27.0% L, anterior part of body very long, preanal is 52.0-52.7% L.

Squamation weak, scales small, sparce, covering only posterior portion of body. Anteriorly the very sparce scales reach to vertical of anus, only a few individual scales occur as far the posterior portion of pectoral. Abdomen and vertical fins naked, only a few scales on the base of latter posteriorly.

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[1] Remaining two examples of 105.1 and 92.5 mm ("varieties or juveniles" of Popov) belong to the above described Lycodes raridens Taranetz & Andriashev.

Lateral line single, mediolateral, quite distinct without an arch, extending to tail. Pectoral small 13.5% L. Ventral inserted a little anterior to line connecting lower edge of gill openings. Ventral 11.3-11.4% of head, 2.5-2.6% L.

Coloring: Head darker above without pattern, as are 6-8 large dark spots on upper part of body which continue and connect on dorsal. In middle of each dark spot a light area, giving the impression of saddles. Their location and form correspond to A. M. Popov's description

Lycodes knipowitschi is close to L. coccineus Bean which the American author's include in the synonymy of the scaleless L. polaris (Sabine). The available material is not sufficient for a final classification of this group of related species (L. coccineus Bean, L. knipowitschi Popov, L. polaris (Sabine) and L. turneri Bean). L. raridens differs from these forms in a better developed scalation which varies slightly.

Our examples from 147 to 252 mm. Measurements are of two mature females 237 and 252 mm. eggs (in fourth stage of development), large, diameter 3.0 mm. (average of 10 eggs). Female of 147 mm already with small eggs.

This species as shown by the TIRH and LGU collections is common in the Okhotsk, Bering and even in the southern Chukchi Sea.

94. Lycodes agnostus Jensen

Among the many collections of the KRASNOARMEIETZ (1933) from the northern Bering there are a few examples of this typical scaleless lycodid. To the present has been known from most north polar seas, eastern part of Barents and White Seas and New Siberian Islands (138° 47' E).[1/] Material collected by K. I. Panin extend the known distribution east and south to the northern part of the Bering Sea and Chukchi Sea.

1. St. 94 (82), Sept. 7, 1933. N. Glubokaya Bay (Koriak Land), 40 M, rock, temp. 1.6°, 1 ex. K. Panin.
2. St. 11 July 29, 1933, 62° 44' N, 174° 12' W (Anadyr Gulf), 74 meters, sandy clay, temp. -1.7°, 1 ex. K. Panin.
3. St. 44 (42) August 13, 1933, 68° 19' N, 174° 11' W (Chukchi Sea SE of Cape Vankarem), 50 meters, muddy clay, temp. -0.2°, 1 ex. K. Panin.

1/ Knipowitch, Mem. Acad. Sci. Petersb., Ser. 8, vol. 19, no. 1, 1906, P. 15.

Head 20.9-22.8% TL, eye small 17.2-20.9% head, smaller than snout which is 26.5-28.6% head. Upper jaw extends to vertical from middle of eye. Lower lip adnate anteriorly, with a very wide lobe posteriorly. Mandibular flaps free, high their anterior edges rounded without anterior lobes. Upper and lower jaws have well developed shallow sensory cavities. Head with many pores having raised edges. Nasal tubes long, almost equal to diameter of pupil with small pores. Interorbital 5.5-5.6% head.

No scales. Lateral line single, mediolateral, distinct. With large pores having raised edges. Above Ll are individual widely spaced pores. Predorsal 27.3-28.3% L, preanal, long, 48.2-49.7% L. Precoral rounded, small 11.5-12.4% L (in an example 92 mm. is 15.2% L).

Coloring characteristic, remaining the same throughout life as described by N. M. Knipowitch (l.c., 1906, p. 16), Upper part of body and head is dark. Along nape a light line. Ten wide light bars on body extending on dorsal fin. Lower part of body light (yellowish white).

According to N. M. Knipowitch this species, a high arctic type, is commonly found below zero, usually below -1°. Most common on clay, though sometimes on sandy bottoms. Hofsten[1/] also considers this a high arctic type. It is interesting to note that there is no single wide spread form of the genus Lycodes in the Atlantic and Pacific, though this genus is represented in the northern part of these oceans by a large number of species (more than 30 in the Pacific). L. agnostus is the only known member of the genus Lycodes which has an uninterrupted distribution from E. Barents Sea to the N. part of Bering Sea.

95. Lycodes (Furcimanus[2/]) diapterus beringi Andriashev

Lycodes (Furcimanus) diapterus beringi Andriashev. New data on the deepwater fish of Bering Sea. Dok. Acad. Nauk, SSSR, 1935, vol. 4, p. 107.

1/ N. Hofsten. Die Fische des Eisfjords, Kung. Svensk. Viden. Handl. 1919, Bd. 54, p. 101.

2/ The scalloping of the pectoral is not sufficient to recognize Furcimanus Jordan & Evermann as a separate genus as it varies in L. soldatovi Taranetz & Andriashev and L. brevipes diapteroides Taranetz & Andriashev, and from a weakly divided lobe in this subspecies to the distinct lobes of L. diapterus diapterus, L. diapterus nakamurae and L. macrochir Schmidt, sp. nov., in litt (Okhotsk Sea).

On the other hand, the Furcimanus series is not natural because its forms independently possess (as if adapted) larger or smaller variations of the lower pectoral lobe, as occurs in other groups. For example, L. diapterus and subspecies has a ventral-lateral lateral line and weakly developed mandibular flaps, whereas L. machrochir Schmidt with a ventral-lateral line has well developed mandibular flaps. This compels us to regard Furcimanus as a genus or subgenus but with the understanding it is a polyphyletic group which should be identified with a distinct name (for instance, congenus).

Numerous examples of Lycodes with a weakly developed lower pectoral lobe were caught by the DALNEVOSTOTCHNIK (1932) off Bering Id., at depths of 200-235 meters, sandy bottom, bottom temperature 2.3° (st. 5 and 70 (59)).

D 112-114, A 97-99, P 18-19, gill rakers $\frac{1 \text{ plus } 13}{1 \text{ plus } 14}$

Head 18.4-21.2% TL, eye large, 26.1-34.8% head. Snout usually equal to diameter of eye, 26.7-30.6% head. Mouth small, upper jaw extends only to vertical from front edge of eye or slightly farther. Bony interorbital very narrow.

Teeth on jaws small, sharp, increasing in size anteriorly slightly. Upper jaw teeth in 2 rows, anteriorly a third row of 8 small teeth. Lower jaw anteriorly with 3-4 rows, reduced posteriorly to 2 and 1 row. 2 or 3 slightly enlarged teeth on vomer. Palatine teeth blunt, often tubercle-shaped, about 7 teeth in one row. Mandibular flaps weakly developed, free, in form of low thin folds, which come close together anteriorly. Upper lip thins slightly posteriorly. Lower lip widens slightly posteriorly. Small head pores and sensory cavities on upper and lower jaw are distinct. Nasal tubes well developed, bluish black, about 2/3 diameter of pupil, surrounded by small pores (5-8) extending toward eye. Gill openings extend ventrally to level of lower edge of pectoral, or lower.

Body very elongated, depth at base of anal 6.5-8.9% TL, predorsal 22.0-24.7% L. preanal 33.4-39.1% L.

Squamation well developed. Scales small, completely covering body and vertical fins. Anteriorly they greatly decrease in size, extending on nape to line connecting gill openings; laterally extending to pectoral and on the abdomen as far as the ventrals.

Lateral line hardly visible, ventral. Originates at gill openings, forms lower limit of scales on nape, extending down and back towards base of anal fin but not reaching it; terminating 1/3 of body from tail. Pectoral cut, forming a weak lower lobe (6-7 rays) and is covered with dense skin. Middle 3-4 rays slightly shortened giving the cut a shortened appearance. Shorter than in the typical L. diapterus Gilbert (Oregon) and L. diapterus nakamurae Tanaka from Japan & Okhotsk Seas. Length of upper pectoral lobe 12.0-14.9% L, lower lobe 8.9-11.8% L. Ventral slender, 2.2-3.1% L. It is attached at vertical from lower edge of gill openings.

Coloring: Scales light, surrounding area greyish brown, darker on abdomen and gill membranes. 5-6 light bars across body extending on dorsal fin, widening ventrally in form of $\wedge$. In young examples (to 100 mm) the pattern is distinct. Ventrally lower portions of $\wedge$ connected in middle of body by light lines. Dorsal and anal greyish, darker above and posteriorly darkening to an intensive bluish black color. Ventral weakly pigmented. End of pectoral darker. Usually a dark spot at dorsal base (more distinct in young; in adults the striped pattern is weak and often disappears).

Changes in growth: Measurements of different sized L. diapterus beringi indicate that certain characteristics may vary with age in different ways. Distribution of sizes of those examples measured are:

Total length	Less than 75	75-100	100-125	125-150	150-175	175-200	200-225	225-250	over 250	Total
Number of ex.	2	1	1	5	4	2	1	3	2	21

In the following table (see below)shows the direction of changes with group (in percentage of TL).

It indicates that:

1. Positively correlated age changes (with length) are: depth of body and length of upper jaw.

2. Negatively correlated changes are: length of head, eye, pectoral and ventral length.

Character	Positively correlated				Negatively correlated			
Total Length	Depth at D base	Depth at A base	Length of upper jaw	Head length	Dia. of eye	Length upper pect. lobe	Length lower pect. lobe	Ventral length
to 125 mm	7.7	6.3	5.9	20.9	6.9	13.8	12.1	4.1
125 to 175 mm	8.4	7.3	6.2	20.1	6.4	13.7	10.8	3.1
175 to 225 mm	8.7	7.5	6.7	20.0	5.8	13.1	10.2	2.7
225 mm & above	9.4	8.1	7.2	19.2	5.3	12.1	9.4	2.2

Lycodes diapterus Gilbert occurs from 685 to 877 fathoms (to 1300 m). Our subspecies along with other deep water representatives (as Nematonurus pectoralis) was found at Commander Ids. at depths of 200 meters. In the stomachs were polychaeta.

This subspecies is close to L. diapterus diapterus Gilbert from oregon but differs in a less deeply cut pectoral and in fewer pectoral rays (18-19 versus 20-21 in L. diapterus Gilbert), fewer bars on body (5-6) and with well developed dark nasal tubes. (Gilbert states "nostrils with a short inconspicuous tube", l.c., 1891, p. 564) and in some body proportions. Our form is close to Lycodes

diapterus nakamurae Tanaka Examples of this subspecies from Japan & Okhotsk Seas differ from our subspecies in a less deeply cut pectoral and in color.

96 Lycenchelys camchaticus (Gilbert & Burke) Pl 2, fig. 26

Lycodes camchaticus Gilbert & Burke, Fishes Bering Sea & Kamchatka, 1912 p 89, fig. 34 (Avacha Bay, 682 fathoms)

Among the deep water collections made by the DALNEVOSTOTCHNIK (1932) were a few examples of Lycenchelys, which according to all characteristics agreed with Gilbert & Burkes description of Lycodes camchaticus but differed in a ventral lateral line, smaller preanal distance and in color Lycodes camchaticus was described from specimens taken in Avacha Bay at a depth of 682 fathoms (1230 meters). Our examples are from:

1 St. 3, Avacha Bay, July 15, 1932. 52° 41' N, 159° 13' E. clay sand with rare fine gravel & iron manganese nodules, 800-1000 meters, bottom temperatures 3.1°, oxygen 0.43 (5.75%). deep water Sigsby trawl. 4 ex. A. Andriashev.

2. St. 5. off Cape Ushin (Bering Id.) July 17, 1932, 55° 25' N 165° 04' E. sand about 200 meters. Beam trawl. 1 ex. A. Andriashev.

The fact that some of our examples are from the same locality that L. camchaticus was described and are very similar to Gilbert & Burkes description (the lateral line may have been overlooked by the American authors) makes us refrain from describing our form as new.

Below follows the description of four adults (2 males and 2 female) which show a strong sexual dimorphism.

D 104-110 A 90-91 P 14-17 Gill rakers $\frac{2 \text{ plus } 15}{2 \text{ plus } 13}$ females $\frac{2 \text{ plus } 8}{2 \text{ plus } 8}$ males

Head (measured to end of operculum)[1/] 14.1-15.8% TL is slightly compressed, equally sharpens toward the snout. Eye small 20.3-20.4% head, 2.5-3.0% L, snout 25.4-28.2% head, 4.4-5.5 % L. Bony interorbital very narrow 3.0-3.2% head. Structure of ventral surface of head (mandibular flaps, pores, lips) very characteristic of the genus Lycenchelys Gilbert (see figs. 18-19).

1/ Head length measured to end of gill membranes (as measured by Gilbert & Burke) is 15.9-16.9% L.

Mandibular flaps almost undeveloped, not raised, cylindrical, connected anteriorly. Especially developed in male. Lower lip widens posteriorly and anteriorly is connected to lower jaw. Distance between free parts of lower lips wide, more in females than in males. On lower jaw is a row of large sensory pores (7 in females, 8 in males extending on preopercular. Upper lip adnate in front. Above upper jaw is a row of large sensory pores (6); in some (large females) merge forming only 1 instead of 2 deep cavities. Upper part of cheek hangs over upper lip in a fleshy fold (particularly in females). Pores below upper part of cheek. Upper jaw short, extending posteriorly only to middle of eye or vertical from posterior edge of pupil. Snout greatly produced making teeth visible in males and even front part of vomer and palatine in females. Development of small pores on head is characteristic, their distribution and number differ greatly in males and females. In latter (females) small scales extend on nape and gill cover as if crowding out the pores.

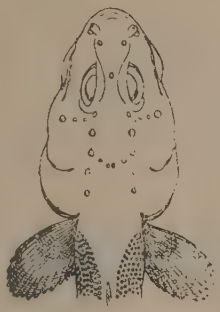

Fig. 16. Lycenchelys camchaticus (Gilbert & Burke) Male.

Teeth on jaws quite small, often unequal, however there are no canines. Along the upper jaw, the entire length of the premaxillary is a single row of fine teeth, pointed only in males, slightly blunt in females. In males 5-6 teeth in the anterior part of the inner row, in females 1-2. Teeth on lower jaw in one row; anteriorly forming a patch from 3 or 4 disorderly arranged rows. Vomer with four teeth, palatine with 9-12 teeth in a single row. Palatine membrane well developed (always absent in the genus Lycodes Reinhardt). Gill rakers on the first gill arch are smooth, no elements on in- or outside. Gill openings wide in males (not quite extending to ventral base); in females smaller, reaching only a little below edge of pectoral base.

Fig. 17. Lycenchelys camchaticus (Gilbert & Burke) Female.

Body considerably elongated, depth at anal base 5.7-8.0% L, predorsal 18.1-21.5% L, preanal 29.6-32.9% L, preventral 13.6-13.9% L. Length of upper jaw 5.9-6.8% L, length of lower jaw 6.4-8.3% L.

Squamation well developed, differing with sex. In females anteriorly scales are large (in 220 mm. example, behind end of pectoral on midline of body 10 scales measure 10 mm). Toward caudal end, scales become smaller, covering a considerable portion of gill cover and upper part of head. On dorsal and anal extending to edge of fin and on end of pectoral on outside are individual scales. On inside of

pectoral to light spot. Males have small uniform scales throughout (in an example 193 mm. at end of pectoral in 10 mm. are 15 scales). Anteriorly scales reach only to dorsal origin, leaving nape and back in front of dorsal naked. Gill covers without scales. On abdomen small scales at pectoral base. Base of ventral with only a few scales. No scales on pectoral. On dorsal and anal, smaller scales than in female. Lateral line quite distinct, ventral. From gill opening curves down and back, wavy over anal fin and disappears posteriorly. In Gilbert & Burke description, nothing is said about the lateral line and it is not shown on their plate. Anal and dorsal not high. Pectoral 6.8-7.4% L. In females it is covered thick skin, has rounded edges and consists of 14 rays, only the lower 4-5 with protruding tips. Males have 17 rays in pectoral, covered by thin skin with tips considerably protruding. Ventral in females is short, 1.4-1.6% L, not extending to base of pectoral, inserted anterior to line connecting lower edges of gill openings. Males have ventrals considerably longer, 2.6-3.2% length, extending to base of pectoral; inserted on line connecting lower edges of gill openings.

Fig. 18, Lycenchelys camchaticus (Gilbert & Burke) Male.

Color (in life) uniform, greyish purple, reflecting blue green, without spots or lines. Darkens ventrally, acquiring a bluish black color on lower part of head and gill membranes. Scales are lighter than surrounding skin. Dorsal, anal and ventral of the same color, greyish purple. Color of pectoral characteristic, its base and edges black, middle a bright greenish blue color; on the inner edge of fin this light area is smaller, crescent-shaped. In formalin and alcohol examples the distinctness of this spot is lost.

Fig. 19, Lycenchelys camchaticus (Gilbert & Burke) Female.

Description is of two males (190 and 193 mm) with weakly developed gonads and two females (220 and 257 mm) with well developed eggs. The fifth example (from Bering Id.) is a young male 124 mm. TL whose sex has not been determined due to little development. It appears intermediate between the sexes and so corroborates the correctness of identifying our sexually differing examples to the same species. Sexual dimorphism is greater developed than in other members of the genus Lycenchelys (i.e., Lycenchelys jordani Evermann & Goldsborough and L. hippopothamus Schmidt).

Our examples found together with other representatives of the deep water fauna (Chionoecetes angulatus, Spirontocaris biunguis, Brizaster townsendi, Ophiophthalmus nordmani, etc.) at the Commander Ids. in shallow water (as does L. camchaticus) of the lower part of the sublittoral zone.[1/]

1/ See A. P. Andriashev, Dok. Akad. Nauk. SSSR, 1935, tom. 4(9), no. 1-2 (70-71), p. 108.

97. Lycogramma brunnea (Bean)

Two examples 60 and 64 cm. long from Bering Id. (DALNEVOSTOTCHNIK, St. 5; 6 miles west of Cape Ushin, Bering Id., at about 200 meters).

98. Gymnelis viridis (Fabricius) Plate 2, fig. 25.

A large number of examples of this circumpolar arctic type were found in the Chukchi Sea in the region of Bering Strait and Anadyr Gulf and also on the coast of Koriak land (61° N) at depths of 40-70 meters.

Head low, flat and depressed; cheeks muscular, expanded. Head length (to posterior edge of gill membrane) 14.0-16.4% TL, [1] depth of head 6.2-7.3% L, considerably smaller than width of head, which is 8.6-10.1% L, eye small 2.7-4.0% L, 19.5-24.1% head, almost the same length as the snout, which is 3.1-4.4% L. Upper jaw different in each sex. In male extends beyond vertical from posterior end of eye, 7.1-8.4% L, 50.0-52.4% head. In females shorter, about 43% of head. Bony interorbital 3.8-6.3% head. Upper lip the same height throughout, solid, not attached to snout. Small distinct pores on lower jaw, edge of preopercular and around eyes. Posterior portion of interorbital without pores. Gill openings extend to level of middle of pectoral base. Depth of body at base of anal 7.3-8.7% L. Predorsal distance not varying much as stated by N. M. Knipowitch in his monograph. [2]

Dorsal fin originates over middle of pectoral fin. Predorsal 16.0-19.0% L. Preanal 34.0-37.1%, pectoral oval and rounded, its length 8.0-9.9% L, 52.4-64.0% head. Body naked. Lateral line on midline without curves, often quite indistinct.

Color varies greatly. Usually in life body is a yellowish green with greyish-blue perpendicular bars (15-18 bars). In one example from Bering Strait the head was raspberry red. Dorsal often with 2-3 blue black ocelli, but these are absent at times. Anal fin dark in males; light in females.

In addition to G. viridis (Fabricius) among the collections from the northern part of the Bering Sea, there are numbers of examples belonging to the genus Gymnelis Reinhardt but represent two new species, the descriptions of which follow.

1/ Measurements of three males and one female, 116-147 mm.

2/ N. Knipowitch (Mem. Ak. Sci. Petersb., 22, no. 4, 1908) indicates predorsal of 46 examples from Barents Sea and North Polar Ocean varies between 16.2-34.8% L.

99. Gymnelis bilabrus Andriashev sp. n. pl. 2, figs. 20-22.

1. DALNEVOSTOTCHNIK expedition, Aug. 4, 1932. St. 23 (17), 64° 41' N, 168° 24' W; Bering Straits, N. W. of Cape Prince of Wales. 40 meters, large gravel, smooth rock and dead shells of Cardium groenlandicum and Pecten islandicus, temp. 0.7°. 2 ex. A. Andriashev.
2. KRASNOARMEIETZ expedition, Aug. 5, 1933. St. 25, 64° 09' N, 171° 58' W; between Chukchi peninsula and St. Lawrence Id., 40 meters, rock and shells, temp. -1.1°. 1 ex. (type) K. Panin.

D 93 A 79 P 12 Gill rakers $\frac{17\ (4 \text{ plus } 13)}{17\ (3 \text{ plus } 14)}$

Head high, not flattened as in G. viridis, so its height (8.0-8.9% L) is greater than its width. Cheeks muscular but not expanded; almost vertical. Head length measured to posterior edge of gill membrane 15.5-16.4% L (to end of opercle 14.6-15.0% L). Eye small, equal snout, its diameter 3.3% L, 20.0-21.2% head. Eyes placed high on head, close to each other, interorbital 3.5-4.4% head. Upper jaw reaching to vertical from posterior end of eye. Its length 6.5-6.6% L, 40.0-42.3% head. Upper lip structure characteristic; on sides high and free, anteriorly, at tip of snout (slightly lower) adnate. Lower lip free, slightly widened anteriorly, but attached narrowly at tip of lower jaw. Length of free part 2-1/2-3 in eye. Palatine membrane well developed as in all forms close to Gymnelis (Gymnelopsis Soldatov, Derjuginis Popov, Commandorella Taranetz & Andriashev, etc.). Small noticeable pores on lower jaw, edge of preoperculum and around eye. Interorbital without pores. Strong conical teeth on jaws, vomer and palatines. Gill opening extends to level of middle of pectoral base.

Body naked, its depth at anal base 8.9-9.2% L. Origin of dorsal over anterior 1/4 of pectoral. Predorsal small, 16.1-17.9% L, preanal 35.7-38.0% L. Unpaired fins high, length of longest dorsal ray twice diameter of eye. Anal with a serrated edge, its height slightly more than eye. Pectoral 8.9-10.0% L. 57.5-64.6% of head. Lateral line mediolateral, indistinct.

Colors (in life): Body light, yellowish with 809 broad rings, marbled pattern of reddish brown. Same pattern on dorsal. Anal and pectoral light. Two small spots with a marbled pattern on head. Posterior one on nape, separated from anterior by a light curved (anteriorly) line. The front spot originates by a narrow line through the lower and upper lips, broadening and continuing on operculum where it is connected to spot on nape. One example differs in coloration; having wide brown bars without marbled pattern but instead irregular small and large light, dark edged spots. Dorsal with three black ocelli.

Measurements from three females, 168-174 mm. Type, a female, 168 mm, no. 24943 Zool. Inst. Akad. Nauk. SSSR.

G. bilabrus differs from G. viridis (Fabricius) found in these same waters primarily in the structure of the upper lip, which is attached to the snout, a higher head, and not depressed head, with cheeks not expanded and also in coloring.

100. Gymnelis hemifasciatus Andriashev, sp. n. Pl. 2, figs. 23-24.

1. Bering Sea. DALNEVOSTOTCHNIK, July 23, 1932, St. 10 (8), 59° 54' N, 170° 36' E, off Cape Olytorsky, gravel 64 meters, temp. 2.3°, 1 ex. A. Andriashev.

2. Bering Sea. DALNEVOSTOTCHNIK, August 25, 1932, St. 47 (40), 64° 15' N, 172° 27' W; between Chukchi peninsula and St. Lawrence Id., small and large gravel, 55 meters, temp. 1.3°. 1 ex. type A. Andriashev.

Head small, high, compressed. Head to end of gill membrane 13.8-14.4% L (to end of operculum 12.8-13.1% L). Cheeks not muscular, vertical. Head width 6.2-6.3% L, about 3/4 of head depth. The depth of head 8.5% L. Eyes very large, almost reaching to edge of upper jaw, diameter 4.3-4.5% L, 30.8-31.4% head, almost twice the snout. Snout 2.5-2.6% L, 17.1-18.5% head. Interorbital 3.6-3.9% head. Upper jaw short 41.5-42.1% head, extending to vertical from posterior end of eye. Upper lip solid, the same height throughout and not attached anteriorly. Lower lip as in Gymnelis bilabrus Andriashev, except that its free parts are narrower. Pores on head small, their distribution as in other species of the genus Gymnelis. Gill openings small, above base of pectoral and not extending past the level of the 1-2 pectoral ray. Small conical teeth on jaws, vomer and palatines.

Body naked. Depth at anal base 8.9-9.3% L. Dorsal origin almost over pectoral base. Predorsal 14.9-15.5% L, preanal 34.0-36.1% L. Lateral line mediolateral; over abdomen is an arch.

Unpaired fins low. Height of dorsal equal to eye (or exceeds it slightly posteriorly). Anal low, considerably less than eye. Pectoral 8.8-8.9% L, 60.7-64.6% head.

Anterior part of body to base of anal is light cream, having four dark brown double lines that continue on dorsal. On posterior portion of body these lines become wider and lighter, acquiring a pattern and becoming indistinct. On the dorsal are 2-3 small brown spots. Top of head dark brown with a wavy light pattern and light line across nape. Anal and pectoral light.

Table 2

Figs. 20, 21 and 22: Gymnelis bilabrus Andt., sp. nov. type.
Figs. 23 and 24: Gymnelis hemifasciatus Andt., sp. nov. type.
Fig. 25: Gymnelis viridis (Fabt.). northern part of Bering Sea.
Fig. 26: Lycenchelys canchaticus (Gilb. & Burke). Anadyr Gulf.

Measured examples: adult females 94 and 97 mm. Type, female, 97 mm., no. 24944 Zool. Inst. Ak. Nauk SSSR.

Gymnelis hemifasciatus differs from G. viridis (Fabricius) in having greatly compressed, but not muscular cheeks, small gill openings and a slight curve in the lateral line. a large eye which is more than twice the snout, low anal fin, color and in some other minor characteristics. It differs from G. bilabrus in the presence of a frenum on upper lip.

101. Commandorella popovi Taranetz and Andriashev.

Commandorella popovi Taranetz & Andriashev, Comp. Rend. Acad. Sci. URSS. 1935 vol. 1, p. 269, figs. 1 & 2. (Medni Id.).

This single member of this group which is related to the genus Gymnelis, a littoral form, thus far has only been found on Medni Id. where it is found in dry (?) places. This form differs from the genus Gymnelis Reinhardt in the absence of teeth on the vomer and palatines and in a free lower lip, distribution of head pores, rounded pectoral and other characteristics.

Family Lycodapodidae

103. Ammodytes hexapterus Pallas[1/]

The sandlaunce is seldom caught by trawl as it buries in sand and gravel. 13 examples were taken by us near Anadyr Gulf in a dredge at a depth of 25 meters, temperature 6.3° on a bottom of coarse sand, gravel and fine gravel. V. F. Shmidt indicates that cod caught in the southern part of Anadyr Gulf (off Cape Ginter) feed exclusively on sandlaunce. G. U. Lindberg's work on far eastern seas shows our type of sandlaunce to require Pallas' name A. hexapterus. In the northern Atlantic Ocean this species is replaced by a subspecies A. hexapterus marinus Raitt. Our examples from Anadyr Gulf have: D 55-59, A 28-32 (in 5 ex.).

Family Macrouridae

104. Nematonurus pectoralis (Gilbert) fig. 27.

Macrurus (Malacocephalus) pectoralis Gilbert, Proc. USNM, 14, 1891, p. 563 (Oregon, 687-877 fath.).

1/ I am grateful to G. U. Lindberg for the correct name of this species.

Macrurus (Nematonurus) magnus Gill & Townsend, Proc. Biol. Soc. Wash. vol. 11, 1897, p. 234 (about off Priblov Id.).

Albatrossis pectoralis Jordan & Evermann, Bull. 47 USNM, pt. 3, 1898, p. 2573. Taranetz, Bull. Far East. Branch Ak. Nauk. SSSR, no. 1-2-3, p. 77 (Olytorsky Gulf).

Nematonurus pectoralis Gilbert & Hubbs, Proc. USNM, 51, 1917, p. 161 (southeast Sahaklin and south of Yezo, 309-510 fath.).

This interesting deep water species, described by Gilbert from Oregon at a depth of 685-877 fathoms was later found in the Bering Sea at the Priblov Ids; quite recently on our coast of the Bering Sea by the TIRH expeditions. Both of our examples (DALNEVOSTOTCHNIK, 1932) were taken in a beam trawl at St. 5, off Cape Uschin, Bering Id. The depth was only 200 meters. They were taken with other representatives of the deep water fauna: Brizaster townsendi, Chionoecetes angulatus, Grimpotheithis albatrossi, Spirontocaris biunguis, Ophiophthalmus normani. Fish: Bathyagonus nigripinnis, Lycogramma brunnea, Lycenchelys camchaticus and also representatives of the genera Careproctus and Paraliparis 1/

Fig. 27. Nematonurus pectoralis (Gilbert) near Bering Id.

1/ Representatives of these deep water species of Liparidae are absent from the laboratory and therefore cannot be identified.

Below is a short description of one of the examples in the Zool. Inst. of the Akad. Nauk. SSSR.

D X, 101, P 20 V 7 Gill rakers $\frac{5}{3 \text{ plus } 11}$

Head 5 in total length. Eye large, 4 times in head, equalling snout, which protrudes as a short rostrum. Over the upper jaw a deep cleft which becomes a deep cavity on each side of the rostrum, continuing up and back to the nasal davity, but is not connected with it. Nasals of only openings, the posterior the larger. Both close to each other and open into a common shallow cavity in the back of which are 10 leaf shaped elements. Suborbital shelf weak. Ridges on upper part of rostrum (middle and paired lateral) are well developed.

Mouth large, upper jaw extending to vertical from posterior of eye. Teeth on jaws strong and sharp. Posteriorly in upper jaw, a single row, increasing in size to the front and in two rows. Teeth on outer row slightly enlarged. Inner teeth slightly curved inwards. On lower jaw all teeth large, sharp, pointed posteriorly in one row. Vomer and palatine without teeth. Barbel on lower jaw short and thin.

Gill openings very large, continuing anteriorly, divided at the point gill membranes connect by a narrow bar. First gill arch connected to inner side of gill cover by a thin elastic membrane, leaving a pore 3/4 diameter of eye. On outside of row of gill arches are 5 tubercle-shaped elements, inner row consists of 3 plus 11 short fat gill rakers covered with small spines. Top of head with noticeable cavities. Interorbital very wide, flat, slightly larger than diameter of eye. Scales quite large, without spines, having three radii posteriorly. They cover the entire body; on head becoming smaller.

Lateral line mediolateral, black. First dorsal not high (its height equal to length of upper jaw), well separated from second dorsal. First dorsal spine weak, not serrated. Pectoral large, reaching to anus. Pectoral length 60% of head. Ventrals anterior, their origin in front of pectoral base.

Pyloric caeca long, thin, 12. Female in the 6th stage of sexual maturity is 805 mm. Ovaries paired, containing remnants of unspawned eggs. Lobes of liver long, asymetrical (left lobe longer than the right; it reaches to anus). Body uniformly grey. Fins darker. Lining of mouth and gill cavity and peritoneum dark.

Measurements in percentage of total length. Head 19.9, depth of body at anal base, about 15.5, preanal 33.4, preventral 19.4, predorsal 22.2, pectoral length 11.9, ventral length 7.4, Measurements in percentage of head. Eye 25.0, snout 25.0, upper jaw 42.5, lower jaw 46.3, interorbital 27.5, distance between ventral and anal 71.9, height first dorsal 41.9, distance between dorsal fins 17.5.

105. Boreogadus saida (Lepechin)

Many authors (Jordan & Evermann, 1898; Soldatov & Lindberg, 1930; L. Zenkevich, 1934, etc.) state that saida is seldom found in the Bering Sea. This is not correct. Saida is a typical representative of the high arctic circumpolar fauna; its life is related to cold water and floating ice. Its distribution is dependent upon these factors and in the Bering Sea it is adjusted to the northern-most cold areas. The 1932 and 1933 expeditions found that saida along with a number of other highly arctic forms (Uleina olriki, Artediellus scaber beringianus) is quite common[1/] in Anadyr Gulf (excluding the warmer southern portion), the Chukchi peninsula, St. Lawrence Id., Bering Strait and very commonly in the Chukchi Sea where it occurs far to the north. It was taken in a trawl (KRASNO-ARMEIETZ, 1933, St. 50 (48), 71° 20' N, 173° 47' W (east of Herald Island) 68 meters, clay, gravel and rock, temp. -1.2°, otter trawl, 6 ex. K. Panin.).

The distribution of saida south is principally delimited by the cold portion of Anadyr Gulf, but in winter, it follows floating ice a little further south. Scofield[2/] on data from L. Turner notes a spawning saida under the ice off the coast at St. Michael (NE of mouth of the Yukon). This also explains the occurence of saida further south at Olytorsky Gulf (A. Taranetz, 1930). Absent in the Okhotsk Sea.[3/]

Our material taken in 30 to 95 meters (the juveniles in shallower water, often a high bottom temperature (5.8 to 7.8°)) indicates a preference for cold waters; 8 finds at low negative temperatures, 6 at bottom temperatures about zero, 5 cases at 1° and above. The DALNEVOSTOTCHNIK (1932) collection contains about 100 examples ranging to 230 mm in length. Otoliths indicate the following age groups. One year (31 mm); 1 plus (75-100 mm); 2 plus (144-158 mm); 3 plus (190-2-- mm); 4 plus (220-230 mm).

1/ Up to 45 examples in the otter trawl.

2/ Fishes of Arctic Alaska, 1899, p. 506.

3/ A. M. Popov (Exp. sea, SSSR, GGI, 1931, vol. 14, p. 147) records saida from the Okhotsk Sea; however I examined in the Ichthyological laboratory of LGU the example A. M Popov identified as Boreogadus saida (Okhotsk Sea, St. 169/54, Nagaevo Bay, Aug. 16, 1930, P. Ushakov). This example is a young Theragra chalcogramma (Pallas).

It is interesting to note the smaller number of eggs in this species, a female 172 mm (in the 4th stage of sexual maturity) had in one ovary only 580 eggs. Saida differ greatly in this respect from other types of the cod family which usually have a great number of eggs (in a treska 1 meter long, there were 9,000,000 eggs).[1] The cause of the low egg production is difficult to explain. The phenomenon must be related to the size of saida and its spawning, but data are almost completely lacking.

The limited distribution of saida to the south and its absence from the Okhotsk Sea and from cold spots on the east coast of Kamchatka, make us suppose it a newcomer to the northern part of the Bering Sea, as with some other high arctic species (Ulcina okriki, Artediellus scaber beringianus, Lycodes agnostus, Myoxocephalus quadricornis labradoricus, Gymnocanthys (sic) tricuspis orientalis and others) where it could enter from the polar ocean as a result of post glacial transgressions that interrupted the connection between Asia and America by opening of Bering Strait.

106. Theragra chalcogramma (Pallas)

Mintai are common in Bering Sea, also being found on the Commander, Aleutian and Priblov Ids. According to our data it occurs N. at St. Lawrence Id. and Providence Bay (northernmost record in strait between Chukchi peninsula and St. Lawrence Id.). It is absent in the region of Bering Straits and the Chukchi Sea. The south, on the American coast from Kodiak to Monterey is represented by the subspecies T. chalcogramma fucensis (Jordan & Gilbert).[2] We found it at 19 stations in Avachin and Anadyr Gulfs where it is common except in the central cold spot of the latter, where as a rule it is absent. Found at depths of 40 to 150 meters, in large schools (to 500 examples in an hours trawling), temperature close to zero (range of -1.1 to 2.6°, oftener from -0.2 to 1°). Mintai feed on mysidae and Amphipoda. However at Cape Navarin it was found that many stomachs contained Chionoecetes opilio. Spawning, according to V. F. Shmidt's data, occurs from May to June. Our examples were caught in early June and beyond; they were in 2-3 stages of sexual development. It is interesting to note that poorly fed and parasitic mintai were found in the more southern regions; mintai from the Anadyr Gulf were well fed and less infected with parasites.

1/ N. M. Knipowitch. Identification of fish from the White, Barents and Kara Seas, 1926, p. 152.

2/ T. fucensis (Jordan & Gilbert) differs mainly in a fewer number of dorsal and anal rays and obviously represents a local form (subspecies) that was more common before the post Pliocene as a full species. The same occurence is noted in the Japan Sea, where according to data from V. F. Shmidt, the mintai differ greatly from Northern examples. Examples of Theragra from Chignik Bay (opposite Kodiak Id.) identified as T. chalcogramma by Scofield (1899, p. 495) is closer to the form fucensis, as it measures: D 11, 16, 17 A 19, 17.

The following table lists the results obtained by K. I. Panin in the measurement of 572 examples from the northwestern part of Anadyr Gulf (KRASNOARMEIETZ, 1933, St. 17 & 18).

Length cm.	St. 17	St. 18
48	1	-
49	-	-
50	1	1
51	-	5
52	-	7
53	-	11
54	-	22
55	2	30
56	7	27
57	7	28
58	3	36
59	3	34
60	12	43
61	13	40
62	12	37
63	13	30
64	17	21
65	14	18
66	12	13
67	3	8
68	6	8
69	8	8
70	3	2
71	1	1
72	1	-
73	-	1
74	-	1
75	-	1
No. of examples	139	433
Average length	62.7	59.9

107. Eleginus navaga gracilis (Tilesius)

Navaga are amphiboreal fish (not circumpolar as stated by Jordan & Evermann (1898) and other authors). They are known along the Murmansk coast east of Cape Ob. The subspecies gracilis extend from the Chukchi Sea south to Puget Sound and Korea. We found wachna (Russian for gracilis?) in Avachin Bay where in June it occurs in considerable numbers in seld (herring) and salmon nets. According to K. A. Vinogradov occurs in Avachin Bay in winter. This was substantiated by a very successful under ice catch made in the winter of 1932/33. According to local inhabitants, it occurs in April in Providence Bay. In our collections there is a single example from Olytorsky Gulf (PALTUS, 1932).

D 12, 19, 22. A 23, 22. Gill rakers 23.

Measurements in percentage of total length (395 mm); head 20.8, predorsal, 28.1, preventral 20.8, preanal 45.6, pectoral length 14.4, ventral length 11.1. In percentage of head, eye 18.3, interorbital 30.5, snout 34.2, upper jaw 36.6, lower jaw 46.3, depth of caudal peduncle 20.7, barbel thick at base, short, 18.7% of upper jaw.

108. Gadus morhua macrocephalus Tilesius

In the Bering Sea, treska is common on both coasts, the Aleutians and Commander Ids. The northernmost record from Providence Bay (DALNEVOSTOTCHNIK, St. 20 (14)). Treska were absent from every haul north of St. Lawrence Id. Local inhabitants state that treska fill the bays in the southern part of the Chukchi peninsula (Providence Bay, Vusten River, Kuguan Gulf, etc.) in winter (November-December). This fact proves that treska in these localities does not make great migrations and does not move to warm areas as do the Atlantic treska.[1/]

1/ These statements also apply to the treska of eastern Kamchatka. They do not migrate far and merely go from deep water to the coastal region. V. F. Shmidt's data indicate treska eggs are widely distributed; this and the absence of large schools in which fish of this type usually migrate, the narrow continental shelf

Because of the absence of large migrations of treska and its sparse distribution commercial trawl fishery of Pacific Ocean treska is impractical.

In Anadyr Gulf we caught treska from 26 to 100 cm., according to K. I. Panin their average measurements were as follows (855 examples, KRASNOARMEIETZ, 1933):

KRASNOARMEIETZ 1933 stations	1	3	17	18	22
Average length, cm.	65.1	62.9	67.4	69.0	73.7
Range	46-90	26-89	29-88	28-100	62-87
Number of examples	394	248	43	124	46

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and existence of cold currents, indicate large migrations would be difficult. Data concerning the biology and commerce of treska are presented by V. F. Shmidt (Ives. Far East Branch Ak. Nauk SSSR, 1930, no. 1-2-3 (on spawning), "Scientific results of the TI RH investigations in the Bering Sea in 1931-32" (1934, ms.), and "On the penetration and distribution of some codfish families in the north Pacific Ocean", Zool. Jour. Tom. 15, no. 1, 1936, pp. 175-183.)